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THE THERAPEUTICS OF ANTIMONY

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History—The history of the use of antimony in medicine is interesting. Its first introduction as a cure for disease dates back as far as the sixteenth century, and in the early part of the seventeenth century Adrian de Mynsicht prepared and described potassium antimony tartrate, commonly known as "tartar-emetic." This was followed by the introduction of a large number of other preparations, but owing to the injudicious use of antimony in such diseases as plague and in other infectious fevers many deaths were caused, and it not only fell into disrepute but its use was actually prohibited by law. During the last decade it has proved so useful in certain tropical diseases of parasitic origin that it has come to the forefront again, and the attention of the chemist and pharmacologist has once more been directed towards this metal. The revival of the use of antimony is due to Cushny who, noting its remarkable lethal action against trypanosomes in vitro and in experimental animals, suggested its trial in man. Lately its use has been successfully extended to the treatment of certain diseases produced by parasites other than protozoa.

Pharmacological Action—A brief account of the pharmacological action of antimony will, we think, help to explain its clinical applications. Compounds of arsenic, antimony and bismuth have been found to kill trypanosomes in dilutions of 1 in 200,000. Although antimony is not very toxic to most protozoa, it has a remarkable action on some of the pathogenic organisms of this class. Cushny has shown that even in dilutions of 1 in 500,000, it has a destructive action on some trypanosomes in the blood. The compounds of bismuth have also been tried but, owing to their marked organotropic properties, they have had to be abandoned. It would therefore appear that antimony has a specific action on trypanosomes, in much the same way as quinine has on the malarial parasites.

On the gastro-intestinal tract antimony acts as an irritant, the degree of irritation being in proportion to the dose taken. Antimony compounds taken by the mouth even in small doses produce nausea and vomiting. The compounds

dissociate in the stomach and intestine, in the presence of the acid of the gastric juice and the alkali of the intestine, and increase the peristaltic movements (see graph VI). The antimony ion is however more slowly absorbed than that of arsenic.

In the blood antimony probably circulates in combination with proteins. Its effect on the blood is to decrease the number of erythrocytes and to increase the number of leucocytes, but these blood changes are not very marked. From the blood it passes into the tissues and although its distribution has not been worked out so thoroughly as that of arsenic, comparatively large quantities have been found in the liver, intestine and spleen. On the circulation antimony has a depressant effect which is brought about in two ways, (a) by a direct action on the cardiac muscle which produces a slow and weak pulse (see graphs IV & V), and (b), by a dilator action on the arteries and capillaries. The combination of these two gives rise to a fall of blood-pressure (see graphs I, II & III).

There is a slight reflex acceleration of respiration from the nausea which it produces, but after large doses there is marked slowing and difficulty in breathing from direct depression of the respiratory centre which renders the vagi inactive. The depression of the circulation is probably responsible for the production of pulmonary congestion, which further hinders respiration.

Excretion of antimony by the bronchial mucosa causes an increase in the amount of secretion and a decrease in its viscosity, and the same effect is also brought about as a reflex action from irritation of the stomach.

On the nervous system antimony in therapeutic doses has a sedative effect, in larger doses it depresses both sensory and motor spinal centres. Metabolism is depressed owing to diminished oxygenation. Depressed metabolism and increased perspiration, due to dilatation of the peripheral vessels cause the temperature to fall several degrees in a few hours.

The excretion of antimony takes place in all the body secretions and a considerable amount is eliminated by the gut, so that large doses of antimony may give rise to gastro-intestinal irritation in this way. A large proportion is also eliminated by the kidneys. Quantitative estimation of the urine after intravenous injections of antimony compounds shows that one-third of the total amount given is excreted by the kidneys in 24 hours.

Antimony Poisoning—In toxic doses antimony causes symptoms very much like those caused by large doses of arsenic, though vomiting is much more pronounced in the case of antimony poisoning and thus prevents its absorption. Small doses continued for a long time produce mental depression, loss of appetite, a suffocative feeling, indistinct vision, confusion and drowsiness.

Other toxic symptoms are pain or discomfort in the stomach region, headaches, general weakness, exhaustion and loss of flesh and in some cases profuse diarrhoea and jaundice. The pulse is generally slow and weak, examination of the blood shows leucopœmia and eosinophilia. There may be albumin in the urine. At post-mortem examination gastro-enteritis with ulceration around the solitary follicles and Payer's patches is seen and also the heart is relaxed and flabby.

Tolerance—As a rule tolerance to antimony does not develop in animals that are subjected to a prolonged course of administration to the same extent as it does in the case of arsenic, and it is stated that protozoa do not become so readily immune.

The Compounds of Antimony—These can be divided into two groups (a), inorganic, and (b), organic.

Inorganic Compounds—There is little to be said about the inorganic compounds of antimony, for the most part they are very irritating and for this reason their application in therapeutics is limited. Antimonium sulphuratum is a mixture of sulphides and oxides and is not much used clinically. Antimonious oxide, Sb_2O_3 , is a white insoluble powder and Martindale has introduced a solution prepared by heating it with glycerine and adding water, a certain amount of glycerile antimoniate is formed. This solution has been used intramuscularly and intravenously and is said to be non-irritating, it is given in doses of 15 or 30 minims. Antimony oxide has been given by the mouth, mixed with food, without ill effects but with little therapeutic action. We have given it in a fine suspension in saline both intramuscularly and intravenously, in the former case it did not give rise to much pain at the time, but a tender swelling appeared on the following day, and in the latter case there were no ill effects. No therapeutic effect was noticed by either of these methods of administration of the oxide. Metallic antimony and antimony sulphide have both been tried in the colloidal state and as impalpable powders, by the mouth, intravenously and intramuscularly without very satisfactory results.

Organic Preparations—These can be subdivided into (1) organic salts and (2) organic compounds.

Organic Salts—To these belong some of the oldest and most useful derivatives of antimony, the best examples being the antimonyl tartrates of potassium, sodium and ammonium. These salts have all been employed in medicine, the sodium salt is the most popular owing to its low degree of toxicity. Fargher and Gray of the Wellcome Research Laboratory have worked out the relative solubility and toxicity of these compounds. Their figures are given in the following table—

Name of compound	Percentage of Sb	Solubility in 100 parts of water at 18°C	M L D grms per kilo intravenously in mice
Potassium antimonyl tartrate	36.17	7.2	0.016
Ammonium antimonyl tartrate	36.5	66.0	0.02
Sodium antimonyl tartrate	38.01	91.0	0.025
Lithium antimonyl tartrate	35.01	180.0	0.04
Quinine antimonyl tartrate	31.36	0.10	0.15
Sodium acetyl-para-aminophenyl stibiate	40.01	readily soluble	0.13

Lithium antimonyl tartrate is even more soluble than the sodium salt and is less toxic to mice. Pilmmer and Thompson have demonstrated that it has strong trypanosomicidal properties but considered that it was more toxic than the sodium salt, consequently it has not been used much therapeutically but, in the light of the recent observations of Fargher and Gray who have shown that its toxicity is only about half that of the sodium salt, it might prove useful and should be given a trial.

Antimonyl tartrates of quinine (and allied alkaloids), emetine, urea, aniline, phenetidine, etc., have been prepared by varying the base. In this way compounds have been prepared with lower organotropic but with undiminished parasitotropic properties. Most of these compounds are, however, still in the experimental stage and have not been used much clinically. Antimonium et ammonio-potassii tartrate known as "antilueticin" was at one time used in syphilis by the subcutaneous route.

Under this heading may also be included some of the esters, the only one which has been used and to which we have already referred is glyceryl antimoniate which occurs in Martindale's solution.

The organic compounds of antimony can be divided into (a), *Aliphatic Compounds*. Both the trivalent and pentavalent members of this series are unstable and have not been tried in therapeutics.

(b) *Aromatic Compounds*—These have attained considerable importance owing to the remarkable success of the corresponding arsenical compounds in the treatment of protozoal diseases.

Sodium acetyl-p-amino-phenyl-stibiate, or stibacetin was one of the earliest members of this series to be prepared. A modified form of this has been prepared by Messrs Allen and Hanbury, it is sold under the trade name of "Stibenyl". It is a brownish powder, soluble in ten parts of water and has a low toxicity to mice. It has been claimed that this compound can be given intramuscularly without causing much local irritation and that as much as 0.6 gramme can be given intravenously without ill-effect. The experience of one of the writers (L. E. N.) with this drug has not been so fortunate, although after intramuscular injections the immediate effects were not very marked, a good deal of pain and swelling occurred after two to three hours. Larger amounts of antimony can no doubt be introduced into the system by giving larger doses of the compound intravenously, but these cannot always be tolerated by debilitated patients and the results have been disastrous.

Sodium-p-amino-phenyl stibiate, or stibamine, has been tried intramuscularly. Its therapeutic application is limited as it is an unstable compound undergoing change even in the dry state and very rapidly in solution. The carbamide derivative of stibamine which has

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GRAPH I

Cat, male—weight 2,200 grms—Ether



Blood pressure (carotid) slight fall.

Kidney volume



Limb volume



Time 6 secs

1.2 Pot. Carb. 10 mgms
 Tard

GRAPH II

Cat, male—weight 2,200 grms—Ether



Blood pressure (carotid) marked fall

Kidney volume.



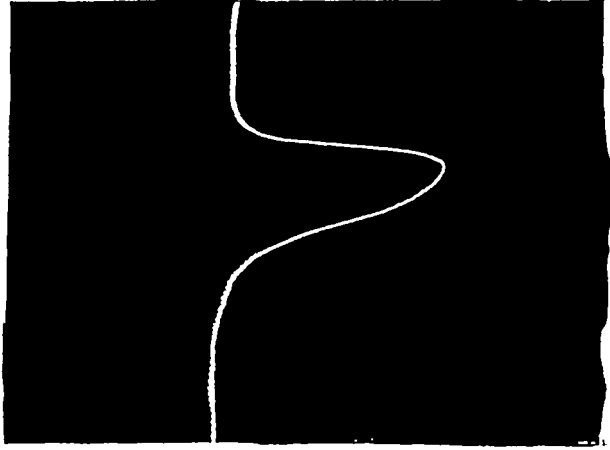
Limb volume

Time 6 secs

1.36g Na. S. Tard-
 10 mgms

GRAPH III

Cat, female—weight 2,100 grms—Ether



Limb volume

Time 6 secs

1.50gms K.S. Tard-
 Injected Suddenly.

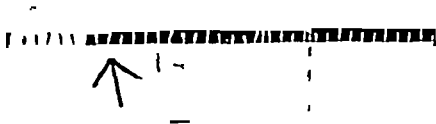
GRAPH IV
Perfused heart—rabbit.



GRAPH V.
Perfused heart—rabbit



Time 6 secs.



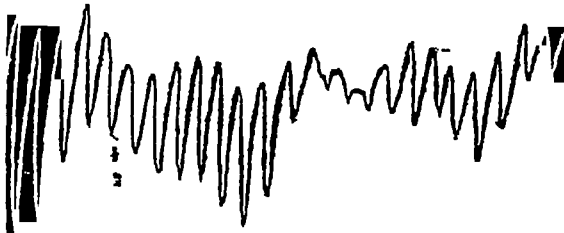
Pot Antimonyl Tart
1 mgm.
Depression

Time 6 secs



Sod Antimonyl Tart.
1 mgm
Depression

GRAPH VI
Intestine—rabbit.



Time 6 secs



Pot Antimonyl Tart.
1--50,000.
Tone increased
Peristalsis irregular
Load moderate
Temp 37.5°O
Cap of bath 240 c c

two NH_2 groups is more active. It may be observed in this connection that here, as in the case of the corresponding arsenic compounds it is the 'para' compounds which are physiologically most active, the 'meta' being only slightly active and the 'ortho' without effect.

There are a number of other drugs such as phenylglycine-p stibinic acid in which the N-acetyl group lowers the toxicity but only to certain animals, for example the horse and guinea-pig, and their applicability to man has still to be tested clinically.

Triphenyl stibine sulphide or sulphoform has been used in such skin diseases as eczema, psoriasis and seborrhœa with success.

In all these compounds antimony is in the pentavalent form. The compounds in which antimony behaves as a triad, and which if the analogy with arsenic is true are more toxic but more parasitotropic are all very unstable and do not form solutions compatible with the temperature and hydrogen-ion concentration of the tissues. To this class belong substances like tri-m-aminotriphenyl stibine which though markedly trypanosomicidal causes severe irritation and sloughing at the site of injection. Dihydrochloride of 3--3' diamino-4,4' dihydroxy stibino-benzene is the antimony analogue of salvarsan but readily oxidizes in the air and is therefore useless from a clinical point of view.

A few co-ordinate compounds of antimony with salvarsan and neo-salvarsan have been prepared. Luargol and disodio-luargol are examples of these. They contain both antimony and silver in non-ionisable form and have proved efficacious in surra, sleeping sickness and syphilis.

Certain other compounds of antimony which cannot be classified under any of the above headings owing to the fact that in these antimony is combined to carbon not directly but through some other elements (e.g. sulphur) have also been used in trypanosomiasis. Sodium antimony dithioglycinate and triamine of antimony dithioglycinate are examples of these compounds and have both been successfully tried in experimental trypanosomiasis.

Therapeutic Uses—Antimony salts such as tartar emetic were formerly used as emetics, but owing to their slow action and liability to set up gastro-intestinal irritation and cause collapse their use has been abandoned. Their expectorant, diaphoretic and sedative properties are limited, owing to their marked depressor effect on the circulation. Neisser tried antimony in the treatment of syphilis and he showed experimentally that monkeys can be rendered immune to the disease by injections of its organic compounds. Tartar emetic and antilutein greatly relieve cutaneous syphilis in man but they do not check the progress of the disease as do arsenic and mercury derivatives. On the malarial parasite antimony injections have no effect.

In leprosy antimony is distinctly beneficial, especially in lung cases. In filariasis trial has been given on a very extensive scale but the condition is only relieved whilst antimony injections are being given. In relapsing fever which prevails in certain parts of India (the U P) it has no effect.

Antimony in Leishmaniasis—The chief interest of antimony to the members of the medical profession in this country lies in its curative action in kala-azar. In 1915 Sir Leonard Rogers and Dr Muir noting the successful results recorded by Caronia and Di Cristina in the treatment of Mediterranean leishmaniasis by intraven-

ous injections of tartar emetic started this form of treatment in India with immediate success. Except that the sodium salt is now more frequently used than the potassium and that it is realized that rather a longer course of treatment is necessary than was previously supposed, no improvement has been made in the treatment of kala-azar since 1915. This form of treatment has met with uniform success wherever it has been practised, and the disease, which was reputed to have a mortality of 95 per cent, has now a recovery rate, under treatment, of nearly the same figure.

It is desirable to begin the treatment with very small doses of the tartrate. We generally begin with 0.5 cc of a 2 per cent solution and increase the dose by 0.5 cc at each injection up to a maximum of 5 cc. In a well-nourished patient who has not got the disease in a very severe form we sometimes commence with 1 cc and increase the doses by 1 cc, and in debilitated patients or very young children we commence with 0.25 cc and increase the dose at each injection by the same amount. Children seem to tolerate relatively larger doses than adults, so we vary the maximum doses between 2.5 cc for a child of two years to 4 cc for a boy of fifteen. If at any time during the course of treatment the injections are followed by coughing or nausea or by a febrile reaction it is advisable not to increase the dose at the next injection and on the other hand if it is followed by vomiting, a very severe febrile reaction or actual collapse, the dose should be decreased by 0.5 cc, and finally if there are any of the more definite signs of actual antimony poisoning such as dangerous slowing of the heart or a tendency to drowsiness on the part of the patient, it may be necessary to discontinue the injections altogether. Diarrhœa and bronchial catarrh are very common complications of kala-azar and it would be very inadvisable to withhold treatment whenever these conditions are present but if the diarrhœa persists and increases, or if pneumonia actually develops it is advisable to withhold the antimony injections for the time.

Dr U N Brahmachari has pointed out that rigors and rise of temperature after the first injection are not uncommon in kala-azar cases. It has been suggested that this may be due to destruction of the parasites. We have observed a reaction occurring later in the course of treatment which in some ways is rather suggestive of protein shock. The patient becomes somewhat collapsed, subcutaneous and submucous hæmorrhages occur in various parts of the body and an erythematous rash appears on the body and limbs. We have seen this occur in a few cases of kala-azar and have always noticed that it was accompanied by a rapid reduction in the size of the spleen and followed by a general and very decided improvement in the condition of the patient.

Injections should be given in the doses indicated on alternate days for from two to four months.

according to the severity of the case and the rapidity with which it responds to treatment

Oriental Sore—This condition occurs very commonly in Northern India and is known by various names, Frontier sore, Delhi boil, Lahore sore, and Baghdad boil according to the locality in which it is found. These sores, though not often serious, are very troublesome owing to their occurrence on the exposed parts of the body, such as the face, neck, arms, etc., on which they may leave disfiguring scars. A one to two per cent tartar emetic ointment applied locally has given good results, but the condition will clear up very quickly under intravenous antimony tartrate injections. As a rule about a dozen injections containing a total of about 8 grains of the tartrate are sufficient, the sore commences to heal up during the course of the injections, but in some cases it may be necessary to give a longer course of 20 injections. Naga or Cachar sore, a condition which clinically simulates oriental sore but which occurs chiefly on the legs and appears in epidemic form amongst tea garden coolie labour at certain times of the year, is not a *leishmania* infection but will usually yield to local and intravenous treatment with antimony tartrate.

Sleeping-Sickness—Fortunately this disease does not occur in this country but one of us (R N C) had the opportunity of seeing a large number of cases in East Africa.

In experimental trypanosomiasis, produced by the inoculation of rats with Nagana (*T. brucei*), the injection of antimony compounds causes a rapid disappearance of the parasite and saves the animal from death. In human trypanosomiasis (*T. gambiense*) although a certain number of cases are said to have been cured by combining antimony with atoxyl, the results as a whole have not been very very promising. The disease runs a very chronic course with a great tendency to relapse after the patient has been apparently free from parasites for months or even years and it is very difficult to say if the cases are really cured. Another point is that the treatment has to be very protracted as it has been found that as much as 500 grains of tartar emetic may have to be given and this has to be spread over a period of two years. This allows the parasites time to infect the C N S and to damage it permanently.

Bilharziasis—Like sleeping-sickness this disease does not occur in India but we have had the opportunity of treating a good many cases amongst military men returning from expeditionary forces during the war. Christophersen employed intravenous injections of tartar emetic in this disease and found that they had a wonderful effect. After 5 to 10 injections there is great amelioration of the symptoms, the bladder pains and scalding sensation during micturition disappear and the urine becomes clear. The *miracidia* show signs of degeneration and do not hatch out in water after 10 to 12 injections. After a complete course, that is to say a total of 20 to

30 grains, has been given the parasites in the portal vein are destroyed. In vitro the destructive effect of tartar emetic on the ova can easily be demonstrated by putting a little of this salt in water containing the ova under the microscope. Normally all the ova hatch out in a few minutes but in the presence of tartar emetic it is found that only a small number do so and the ciliated embryos soon lose their darting, corkscrew-like movements and die.

Guinea Worm (*Filaria medinensis*)—This disease prevails in certain parts of northern and western India. Injections of tartar emetic have a very distinctly beneficial effect on the condition, antimony tartrate seems to destroy the worms and embryos. A course of 8 to 10 daily injections of one grain each is usually found to effect a complete cure, the inflammation being quickly relieved and the worms in some cases coming to the surface, but relapses occasionally occur and the course may have to be repeated.

Filariasis—The results of antimony injections in this disease have been very disappointing. Some observers have claimed cures, they gave comparatively large doses of antimony tartrate intravenously, as much as $2\frac{1}{2}$ grains in each dose, and carried on the injections until intolerance developed. We have treated a number of cases in Calcutta giving doses up to 2 grains and continuing them for long periods but have only caused a temporary relief.

Modes of Administration of Antimony—(1) **External application** (a) As an ointment in the skin lesions of oriental sore and American leishmaniasis, a 2 per cent tartar emetic ointment, to which sodium bicarbonate has been added to neutralise the acid formed by decomposition in the presence of sweat and to prevent this from breaking up the salt and producing irritant substances, has been used with success.

(b) **By Inunction**—Metallic antimony, 5 to 10 per cent in lanoline has been used as an inunction to supplement other forms of treatment. One drachm has been rubbed into the skin of the abdomen every other day and it has been found by this method that a certain amount of antimony is absorbed. A compound, dimethyl-phenyl-pyrozalin trichloride, has been used with success as an ointment in 20 to 40 per cent strength in experimental trypanosomiasis, but its effect on man is doubtful.

(c) **By Ionsation**—By this method small quantities of antimony can be introduced into the system but it has never been given an extensive trial.

(2) **Absorption from the Intestinal Tract**—(a) **By the mouth**—Only very small doses of any soluble form of antimony can be administered by the mouth and insoluble forms have no action. Antimony oxide mixed with food, antimony oxide dissolved in weak hydrochloric acid and metallic antimony in the form of lozenges have all proved disappointing. For the treatment of protozoal diseases where bigger concentrations are required

this method is useless with any compound that we have at our disposal

(b) *By the rectum*—Solutions of 2 per cent of the tartrate are very irritating and painful but very dilute solutions can be given without ill effect. The therapeutic action is always disappointing.

(3) *Intramuscular Injections*—Intramuscular injections of most of the ordinary compounds are irritating and painful. Martindale claims that his "injectio antimonii oxidi" and Bramachari that acid antimonyl tartrate in combination with urethane are almost painless. Stibenyli is also reputed to be painless but this has not been our experience. We have found that a pure preparation of sodium antimonyl tartrate given strictly intramuscularly will give rise to some pain and slight local thickening but that as an alternative method of treatment in kala-azar, when for some reason the intravenous method cannot be adopted, it is well worth trying.

(4) *Intravenous Injection*—At the present time this is the only satisfactory method of administering the salts and compounds of antimony in the large doses that are necessary for the treatment of protozoal diseases. It has been asserted that these injections are of the nature of a surgical operation, cannot be undertaken by the ordinary practitioner and are even dangerous. Experience has however shown that the technique is simple and that there is no difficulty about anyone mastering it after a little practice. If proper care is taken and the dose is regulated there is no danger to the patient and no more discomfort than is caused by the prick of the needle.

The Technique of Intravenous Injections—The best veins to choose are those at the bend of the elbow, but if the patient is well covered these veins may be buried in fat and it may be easier to puncture one of the veins on the back of the hand. The latter are very movable and it is often very difficult to puncture the vein, even when the needle is through the skin, as it recedes in front of the advancing needle and then suddenly either under or over it. There is a large vein at the back of the wrist running over the outer side of the head of the radius between the tendons of the extensor carpi radialis longior and of the extensor pollicis brevis which is extremely useful, especially in children in whom it is often as big as the little finger. The vein is not usually blue but can very easily be felt and if congestion is caused will stand out very prominently. The one disadvantage in using this vein is that the skin over it is usually tough.

The skin over the vein should be sterilised with spirit. If iodine is used it must be washed off with spirit as otherwise it will increase the difficulty of seeing the vein. Washing the skin with xylol will increase the visibility of the veins but is seldom necessary. Congestion is caused by putting a rubber ligature round the arm above the point at which the vein is to be punctured. This ligature must be tight enough to stop the venous return but not tight enough to stop the arterial flow to the limb. Further congestion may be caused by gentle upward massage or by rapid extensor and flexor movements of the limb by the patient. The patient should be either lying down or sitting at a table with the elbow on a small pillow. The syringe should be held in the right hand at an angle of about fifteen degrees to the skin surface and entered upwards and along the long axis of the vein. The point may enter the vein immediately or the vein may slip

to one side, in the latter case the point of the needle must be made to follow the vein, pressing into the side of the vein until it is pierced. Directly the vein is punctured blood will enter into the barrel of the syringe, which will have been previously loaded with the dose that is to be injected. The congesting band is now released and the solution slowly injected. The injections should in all cases be given as slowly as possible; not less than two full minutes should be taken over the injection of a maximum dose. When once the point of the needle is in the lumen of the vein every effort must be made to prevent its either slipping out again or being pushed through the posterior wall of the vein. During the loosening of the constriction and the pressing home of the plunger the operating hand must be steadied by being rested on the arm of the patient. If at any time during the operation there is any doubt as to whether the point is within the lumen of the vein, the operator can satisfy himself by slightly withdrawing the plunger again. If the needle is still in position blood will again flow into the syringe. Great care must be taken that no air escapes into the vein from the syringe. This will be most apt to occur when the piston does not fit tightly into the barrel or where the needle does not fit tightly on to the point of the syringe.

The syringe that is used must be all-glass or glass and metal. The smaller the syringe the easier it will be to give the injection. A 5 c.c. syringe will be generally found the most useful one for this purpose.

In children who are very liable to wriggle during the operation a good method is to hold the syringe in the right hand and with the left hand grip the arm so that the back of the elbow lies in the hollow of the hand and the first two fingers and the thumb can be approximated in front of the elbow, as the needle is passed into the vein the barrel of the syringe is gripped between the fingers and thumb of the left hand so that the syringe and the arm cannot possibly move independently. It will not be found necessary to grip so tightly that the venous flow is stopped.

SYMPTOMS ASSOCIATED WITH INTRAVENOUS INJECTIONS OF ANTIMONY TARTRATE

If the treatment is commenced with small doses and the doses are increased gradually up to a maximum of not more than 0.1 gramme, as suggested elsewhere in this paper, no symptoms will be observed in the majority of cases, but a certain number of patients appear to possess a degree of intolerance to the drug and in these certain symptoms may occur even after very moderate doses.

Severe fits of coughing are very frequent immediately after an injection and in some cases retching and even vomiting may occur. These symptoms are less likely to occur if the injections are given on an empty stomach and they can in a number of cases be checked by reducing the dose and then increasing it slowly.

In kala-azar a slight reactionary rise of temperature is very common and occasionally a rigor will occur. In one case the injections were always followed by very profuse sweating without any rise of temperature.

Certain symptoms connected with the circulatory system are also noticeable. Immediately after the injection there may be some cyanosis and the pulse may become rapid and irregular, but this soon passes off. After the treatment has been continued for some time there is a marked

slowing of the pulse rate in a few cases, probably due to the cumulative action of antimony. We had a case in the Carmichael Hospital whose pulse dropped to 40 per minute, but gradually returned to normal when the injections were stopped.

Certain cerebral symptoms may occur. The patient is liable to become depressed when the injections have been continued for a long period and cases sometimes develop persistent headaches or hemicrania during the course of injections. If the headaches cannot be controlled with sodium salicylate and sodium bicarbonate, the injections may have to be suspended for a time. Rarely loss of consciousness has occurred after an injection.

Pain in the large joints, especially in the shoulders, coming on a few hours after injection and lasting from an hour or two to a day or two is comparatively common. The pains sometimes start after a dozen injections but it is more usual for them to appear towards the end of the long course of injections that is necessary in kala-azar. It is a very noticeable fact that joint pains come on earlier and with much greater regularity in cases other than kala-azar. In about 50 per cent of cases of filariasis or oriental sore that we have treated joint pains have come on within the first 10 injections but in kala-azar cases it is extremely rare for them to come on as early as this. Codein not only relieves the arthritic pains but some of the other symptoms are also benefited. A less common symptom is an acute arthritis particularly affecting the wrist joints, the knee joints and the ankle joints. This condition usually subsides in about 10 days, during which time it is advisable to discontinue the injections.

An irritating papular eruption occasionally occurs on any part of the body. It can be eased by soothing lotions such as calamine, but it will usually remain until the injections are discontinued. Any form of skin disease seems to be kept up by the antimony injections. We have had cases of kala-azar with various forms of skin eruptions which have resisted all forms of treatment but which have disappeared immediately the injections were discontinued.

Toxicity Due to Changes in the Solutions—Rogers noticed that sterilized solutions of tartar emetic sometimes developed a white precipitate after a week or ten days. In cases in which such solutions were given the patients had severe rigors, a marked rise of temperature, dyspnoea and in some cases collapse. Such solutions show a slight but distinctly increased toxicity to animals. Observations in collaboration with Major H. W. Acton, M.S., and Mr. Nihar Ranjan Chatterjee have shown that this precipitation is due to the growth of moulds which attack the tartrate molecule and produce certain changes in the solution and alter their power of rotation of light, the changes being probably of the same nature as those produced by *Penicillium glaucum*. These investigations are not yet complete.

A careful examination of the solution should therefore be made in every case before it is injected and if there is the slightest sign of turbidity it should be rejected. Solutions should always be made immediately before injection, and as there are now small soluble tabloids of sodium antimony tartrate made especially for this purpose on the market, there should be no difficulty about this, or as an alternative measure 0.25 per cent carbolic acid should be added to the solutions. If this amount of carbolic acid is added the solutions can be kept indefinitely without any change.

Relative toxicity of antimony tartrate and other antimony solutions—We have already noted the relative toxicity of some of the antimony compounds on experimental animals such as mice. Thomson was the first to use sodium antimony tartrate and found that it was just as efficacious a trypanosomicide as tartar emetic. Rogers experimenting on rabbits and pigeons showed that it was slightly, though distinctly, less toxic both as regards its local irritative effects and as a circulatory depressant. We carried out some experiments to show the relative effect on the tissues of solutions of the two tartrates and of some other compounds. We used young rabbits for these experiments and injected the solutions into the intramuscular layers in the gluteal region. The rabbits were killed after 24 hours. The results were—

Potassium Antimony Tartrate—Œdema of the skin and subcutaneous tissues. Œdema and hyperæmia of the muscles. Hæmorrhages round the site of injection and superficial necrosis of the muscle fibres.

Sodium Antimony Tartrate—Little or no œdema of the skin and subcutaneous tissues. Œdema and hyperæmia of the muscles, hæmorrhages round the site of injection, less severe but more extensive than in the case of the potassium salt. Friability of the muscle fibres at the site of injection.

Stibaceticum—Very slight œdema of the skin and muscles. Local hyperæmia. No signs of hæmorrhage into the muscles. Friability of the muscles at the site but no necrosis.

Stibamine—No œdema of the skin or subcutaneous tissues. A little local œdema but no hyperæmia. Very slight friability of the muscles at the site of injection.

The effect of moderate doses of potassium and sodium antimony tartrates on the heart, blood-pressure and respiration is shown in graphs I and II, the drugs being injected into the vein very slowly as is done clinically and the effects being very slight. The effect of a large dose introduced into a vein suddenly is shown in graph III, a very marked and sudden fall of blood-pressure occurs. The depression of blood-pressure in animals caused by sodium, potassium antimony tartrates and by stibanyl is probably due to the antimony ion, as the effect is almost the same in all three compounds and is not more

marked in the case of potassium. In the perfused isolated rabbit's heart depression is visible (see graphs IV and V), the amplitude is decreased and the heart is slowed. There is a slight decrease in the limb volume caused by constriction of the vessels, this is probably due to stimulation of the vaso-constrictor centre in the medulla.

Cumulative Action and Contra-indications.—The distribution of antimony in the tissues and its elimination have not been thoroughly worked out yet, but it has been pointed out that one-third of the amount injected is excreted by the kidneys in 24 hours and probably a large amount by the bowel, so the danger of accumulation in the body does not seem very great when the organs are functioning properly. The possibility should however always be borne in mind. If heart, kidney or lung disease exists antimony should be given with the utmost caution and before starting a course of treatment these organs should be thoroughly examined or their functional state investigated. In weak, emaciated and anæmic subjects a small dose should be given in the beginning and the increase should be very gradual.

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A MALARIA SURVEY OF SAWANTWADI STATE

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INTRODUCTION

EARLY in 1922 the writer had the honour to be invited by H. H. the Sardesai Maharaj of Sawantwadi with the sanction of the Bombay Government to conduct an enquiry into the great prevalence of malaria in his State the result of which investigation is here recorded.

For Western India the enquiry broke new ground and was therefore the more interesting, an interest which the prevailing physical conditions enhanced. In Sawantwadi State, however, the presence of malaria had been noted by non-medical observers long ago, for in their interesting 'Memoir of the Sawant-Waree State,' published in Selections from the Records of the Bombay Government, 1855, Mr W. Courtney and Major Auld wrote "The diseases which have been most prevalent in this country for the last fourteen years have been fevers of the remitting and intermittent types," while the medical observations for Western India, excluding any in Bombay City, have been reported in the Proceedings of the 3rd All-India Sanitary Conference in a supplement to the *Indian Journal of Medical Research*, 1914. Froilano de Mello wrote of malaria in Goa, describing the administrative difficulties, and recounted future programmes of sanitation, but scarcely touched upon the epidemiology of the subject while Majoribanks reported the conditions on Salsette Island and came to the conclusion that a proximity to hills, where a spleen index of over 50 per cent was usual, was the most important factor. On the coastal flats the index was often nil*.

Physical Conditions.—The State, with an area of about 1,000 square miles, lies almost wholly in the Bombay Konkan. A small tract of it however, with an average altitude of some 2,500 ft lies 'above-ghat,' in the Deccan, as a narrow strip, which runs parallel to the edge of the ghat and includes the delightful hill station of Amboli.

To the South the State is bounded by Portuguese-Goanese territory, to the West by a very narrow strip of British Indian territory or waters which wash the once important harbour of Vengurla, to the North by the British Indian district of Ratnagiri, to the East by the Maharatta Kalthapur State and the British district of Belgaum.

Nearly the whole State is gently undulating or slightly hilly, in some regions of course being more broken than in others, but the ghat with its buttresses holding up the Deccan partakes of a mountainous character. The agricultural indus-

* It is understood that Mhaskar has made a subsequent contribution to the study of malaria epidemiology in Western India in a paper on the disease in Kanara District, in a voluminous report to the Government of Bombay which has not been published.

tries of the State centre around paddy-cultivation, in some places a winter crop being taken by means of irrigation in addition to the usual crop. The cultivation in the hillier parts is restricted to the terraced neighbourhood of the nullahs, whereas the whole of the gently undulating lands is covered by the fields. Excluding the patches of cultivation, the forest holds sway, and from it good teak and other woods are obtained.

The climate above-ghât even in the hot months of April and May is very pleasant, while at Christmas it is delightfully cold. On the other hand below-ghât the humidity and enervating nature of the air is very trying.

Except in a few small bazars and in Sawantwadi town the people do not live in dense aggregations, their houses are discrete and each set in its own small holding of land, so that their condition is exactly comparable to that of a parish in England.

Preliminary Enquiry—At the outset of the enquiry the writer found that malaria had become a serious menace at very definite dates in certain localities, for instance Narur at some time between 1860-70, Amberi 1870, Mangaon 1918, Sawantwadi town 1919, Insuli 1921. The popular opinion with regard to these outbreaks implied that the villages were previously sterile and by mischance had become infected from without, and there was a fear that places considered now sterile also might become infected.

Now although there can be no doubt that at these dates in these localities malaria started to assume alarming proportions, for the census returns, as also the abandonment of the villages and cessation of cultivation of lands proved it, yet proofs equally exist that infection was present previous to the epidemics, which, by their virulence, have left such a mark upon the popular imagination. This is an important point, these virulent epidemics do not need the explanation of a mischance infection from without, even if such an explanation be sound. They sprouted from the seed sown before, perhaps long before in the place. For instance Sawantwadi town was supposed to have become infected in 1919 from a neighbouring village Kolgaon, but Courtney and Auld, as already stated, noted its infection in 1855, and the Municipal Secretary informed the writer that 25 years ago at least and as long as he can remember in his long and official association with the town, some few cases of fever have always occurred. Add to this that in 1917-18, 84 deaths from fever were reported, and in 1918-19, 381, and the reader may be sure that even granting the fact that influenza raged in 1918-19, a large number of these deaths were due to malaria.

With regard to places considered to be at present sterile, and in which it was feared that infection might supervene such were found to be not uninfected. Banda, Ajgaon, Nerur, Kudal, Danoli, each gave a positive malaria spleen-index in the children, proof that public opinion as to the

previous sterility of places which have suffered severely cannot be relied on any more than it can in these instances. Is it likely indeed that places such as Amboli, Kudal, and Banda, all chief towns in the State lying on main roads, should have remained uninfected, while on the contrary little villages on country footpaths are severely infected, because infection has by good chance not come to the former but by mischance has come to the latter?

Ross moreover in laying down, in his Prevention of Malaria, the following demonstrable proposition "Whatever the original number of malaria cases in a locality may have been, the ultimate endemic malaria rate will tend to settle down to a fixed figure" directly refutes arguments such as those advanced to prove that infection from without of villages in Sawantwadi State has been a matter of any importance.

It was obvious then that some other reason existed for the very variable and eccentric incidence of malaria in the State, and the problem before the writer was to determine the factors on which the variable endemicity is dependent.

Methods—For the purpose of the enquiry the State was divided into three characteristic divisions—

1 The slightly undulating land, comprising the valleys of the biggest rivers

2 The mountainous ridges spurring the Deccan

3 The broken hilly country distinct from these spurs

Besides these tracts two others of rather anomalous nature were examined. They will be considered under the heading "Anomalous Tracts."

In each of these divisions the splenic indices were taken and the depopulation record of certain villages as compiled by Mr Gawan Taylor, I.C.S., was regarded as confirmatory evidence of high malarial endemicity, sometimes the school attendance registers were consulted with the same object, a malaria map kept by H. H. the Sardesai Maharaj was very useful in indicating from what regions reports of severe or slight malaria had come, and finally a collateral enquiry was conducted into the prevailing mosquito fauna.

RESULTS

1 *The slightly undulating country, or valleys of the biggest rivers*

Endemicity—Under this division is included the strip of land above-ghât at about 2,500 ft above sea-level. Here the sub-assistant surgeon-in-charge informed the writer that malaria in the villages did not seem to be of much importance. The population incidence in Amboli was as follows—

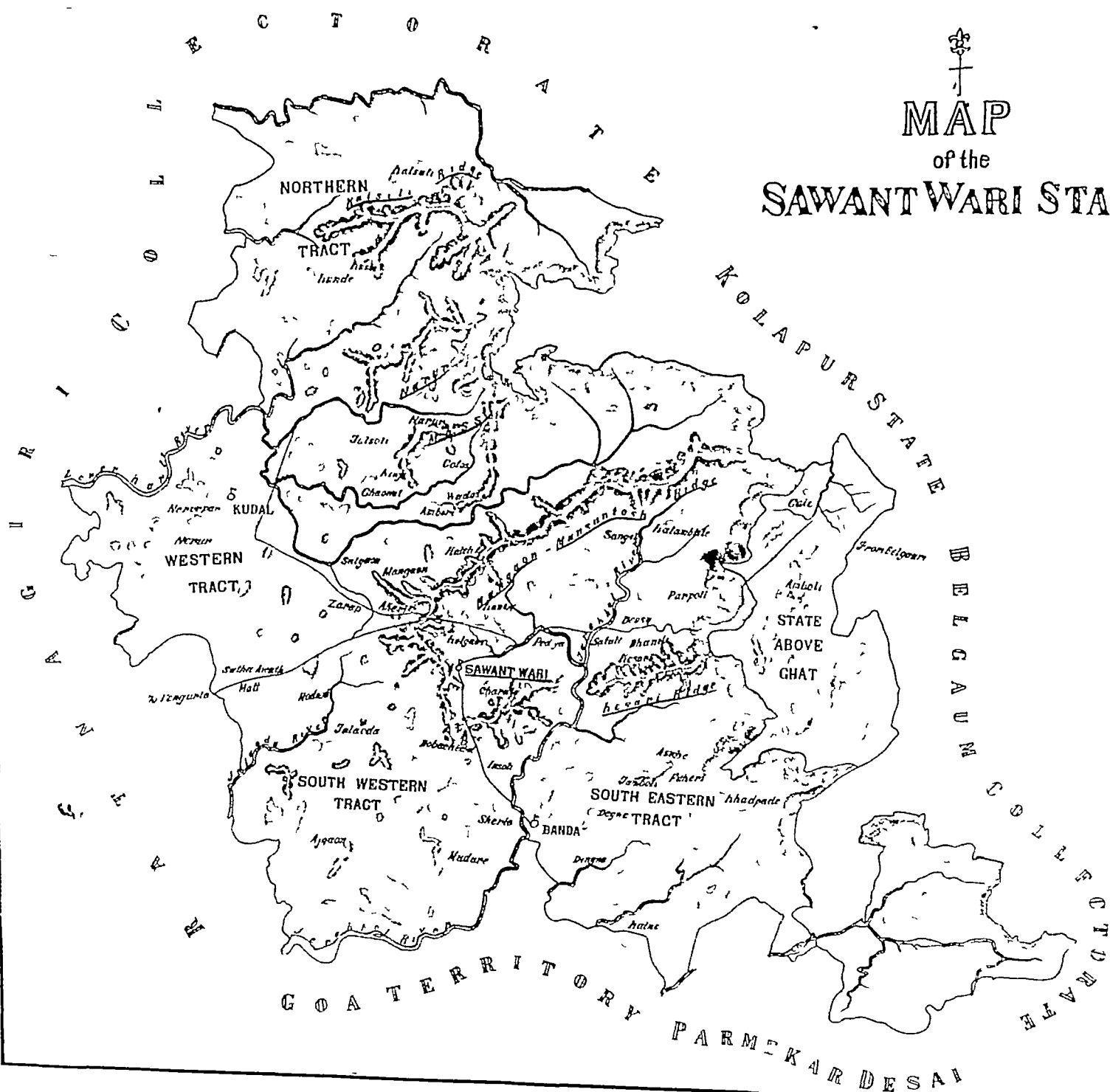
	1881	1891	1901	1911	1921
Year	1,146	1,785	1,471	1,611	1,614

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MAP of the SAWANTWADI STATE



while the splenic indices taken were —

Village	Population	No of children examined	Splenic index
Amboli	1,644	150	8 per cent
Gelo	632	12	5 "

Below-ghât in the region around Banda the basin of the Terekhol River opens out considerably into a wide and very gently undulating plain, which extends north-east for about six miles, here Banda town was visited, and the splenic index in 109 children was 5 per cent

Another region in this section is the basin of the Talauda River. The malaria map mentioned above showed it to be free from malaria but Talauda village was found to have a splenic index of 21 per cent (101 children), while Hodauda, another small village a short way from Talauda, showed in its population returns no evidence of malaria

In the countryside about the Lower Karli, a big river, but little malaria was betrayed by the malaria map. The splenic indices were as follows —

Kudal	15 per cent.	130 children examined
Zarap	5 "	25 , "
Salgaon	0 ,	23 " ,

In addition to the above examples the following cases, which should not strictly come for consideration into this section, may be mentioned. Satuli, a village near the foot of the ghât, was found to be very malarious, though Devsu, somewhat further away on flatter ground, was not so malarious. Sangel, a rather extensive village was much healthier in the parts nearer the river than those near the foot of the hills, Kalamhist among many surrounding badly-infected places was comparatively free from malaria it lay "more on the flat land". Ghaonal at the toe of the Narur hills was not so malarious as the villages among the hills, while the hamlets of Insuli village, which lay at the foot of Insuli ghât, were very severely infected, those on the contrary lying further down on the 'flat land' toward Banda being "quite healthy". But most striking of all was Mangaon, where the bazar, comparatively densely crowded, which lay in the centre of a wide flat area surrounded by hills was fairly healthy though the children living in the houses along the foot of the hills were very highly infected.

All these observations establish the fact that the flat or undulating lands of the State, whether they be above-ghât or in the Konkan, are comparatively healthy.

The mosquitoes found in these tracts—Paddy is extensively grown on these undulating lands, while the nullahs of relatively big rivers, sometimes through tributaries which pursue a tortuous course over the land, take the drainage of the

fields. The fields are but seldom summer-cropped, after the winter crop is harvested they are dried off, so that during the hot months the only water to be found on the land is in the river beds, or perhaps in the tributary nullahs, in innumerable small surface wells from which stock is watered, or in deep wells, from which man's requirements are satisfied.

During the rains the nullahs are seething torrents, but during the dry weather small pools dammed up by silt or debris are left at the sides of the river beds. These pools were found to harbour the natural carrier *culicifacies*, as also the slight carrier *fuliginosus* as well as *rossi* and *vagus*, the presence of *vagus* in these tracts is interesting as it has previously been taken to be a more eastern species, however there was no doubt about its occurrence for adult specimens were hatched out from larvæ with posterior clypeal hairs set close together, which is diagnostic of this species. A summer crop of paddy is taken very often from the beds of the nullahs above-ghât, and at times in the fields *jamesi* and *culicifacies* were found in large numbers.

In the tributary nullahs, which have carved a tortuous course over the land a good deal of scour takes place during the rains, and afterwards when the water decreases weeds spring up, and anopheline breeding pools are formed. In such situations *jamesi*, *vagus* and *rossi* were found, whether the bed of the nullah was rocky or earthy.

The writer's visit did not correspond with the cultivation of the winter-paddy, but it seems likely that its mosquito fauna would be identical with that which he found in the fields of the sparse summer crops. These species were — *punctulata* (one specimen), *jamesi*, *barbirostris*, *rossi*, *vagus* and *culicifacies*.

A large number of larvæ were identified as of either *barbirostris* or *sinensis** but not a single specimen of the latter species was hatched out at any time, a most striking difference from that obtaining in more eastern paddy fields.

In the shallow wells for watering stock the mosquitoes found were *vagus*, *rossi*, *fuliginosus*, *barbirostris*, *jamesi*, none of them a potent carrier.

The mosquito survey then in this section bears out the conclusion reached in the endemicity survey that the slightly undulating regions of the State, whether above-ghât or in the Konkan, suffer but very slightly from malaria, the mosquitos here, with the exception of *culicifacies* are not serious carriers here and there *culicifacies* occurred in fair numbers while *jamesi* and *fuliginosus*, both slight carriers, were taken in enormous quantities in some of the paddy fields. Nevertheless the conditions of village life seem to be such that a fair prevalence of a species which is a bad carrier or a great prevalence of a slight carrier does not

* This species is now correctly named *hyrcanus*, but it is better known as *sinensis*. In the larval stage it is indistinguishable from *barbirostris*.

produce generally more than a very low endemic index

2 The mountainous ridges spurring the Deccan and the villages along the ghât

Endemicity—The ghât forms a bastion some 2,000 ft in height, the Deccan at its summit, the Konkan at its foot. Within the limits of the State it is spurred by two gigantic buttresses, which may be termed the Narur Massif, and the Mangaon-Masantosh Ridge, each of which was the object of investigation.

(a) The Narur Massif—This region it is that has suffered so severely during the last generation and in it malaria has probably been endemic for ages, but the epidemics which have produced such alarm date from the decade 1860-70. The malaria map shows that almost without exception the villages here have suffered severely, the depopulation having been considerable (Gawan Taylor) as the following table shows—

	1881	1891	1911	1921
Gotos*	1105	830	640	406
Nawaji	618	562	388	213
Wados	366	297	247	145
Tulsolit Narur	533	490	349	210

(b) The Mangaon-Masantosh Ridge—This ridge is a long spur with subsidiary spurs about 30 miles along its main axis. It is comparatively narrow and steep, and its elevation is gradual from its toe to the level of the Deccan. To the south it is pot-hook shaped, and the bend of the hook embraces the site of the capital town Sawantwadi.

The villages along the ridge are very severely affected though those which have lands approximating to the larger streams in the bounding valleys are not so unhealthy; moreover those which lie higher up on the ridge, or toward the higher end of the ridge are not so badly hit. The malaria map bears out these general statements very well. The map shows very strikingly that the villages high up on the ridge, or on the ghât at the Deccan end are marked as only slightly affected.

The following figures give examples of depopulation in villages on the ridge—

	1881	1891	1901	1911	1921
Kaleli	951	1,000		819	494
Kurke-1	1,565		1,704		1,257

The splenic indices of the following villages were taken with the result shown

Akeri	97%
Pedivā	60%
Mangaon	64%
Mazgaon	51%
Kolgaon†	97%
Sawantwadi & environs	85%
Chirathe	63%
Insuli	64%
Dobachichal t Insuli	91%

The mosquitoes prevalent in these tracts—The species of anopheline in the ravines which course

down the sides of these hills which one would expect to find more than any other is *maculatus*, the bad malaria carrier. And indeed it was discovered in all such situations, for example in the rocky nullahs on Narendra Hill behind Sawantwadi town**. Where however such nullahs were densely shaded by foliage *leucosphyrus* was found, while in springs or swamps of water at the hill-foot, rather below the *maculatus* range, the species *theobaldi* which is stated to be a carrier, was very prevalent. Sometimes among much aquatic vegetation *theobaldi* was associated with *fuliginosus* and *jamesi* or where the water was fouler or muddier with *vagus* and *rossi*.

In the paddy fields at the foot of the hills and in the little valleys between the hills, the writer unfortunately had no opportunity of making any observations before the land was dried off, whereas some potent carrier may have been found in those situations. In one place a few specimens of the reputed carrier *karwari* were captured in a swampy grass-grown ravine where the conditions much resembled those of paddy cultivation, which indicates that during the wet season this species may be more commonly found in the paddy. Besides this finding a few patches of irrigated paddy harboured *punctulata*, *barbirostris*, *jamesi*, *rossi*, *vagus* and *fuliginosus*, or the same fauna as in paddy on the gently undulating lands.

It is permissible here to introduce a comparison with another country, Malaya, where the mosquito fauna is Indian in type. In the paddy fields there among the hills the variety of *minimus*, named *aconitus*, a bad carrier, delights particularly in the swift running water of the irrigation channels, its occurrence therefore in these Indian paddy fields is not improbable. However in the course of the enquiry only two irrigating channels which were being used were encountered and although very carefully searched, yielded no other species than *jamesi*.

In the shallow surface wells at the edge of all paddy fields are found *fuliginosus*, *barbirostris*, *vagus*, and *rossi* in pukka wells of which a very large number were diligently examined, only two contained anophelines (*fuliginosus*, *vagus*).

Where the hill streams have debouched on to flatter or less hilly country or have discharged their waters into rocky streams running through the main valleys which bound the Deccan spurs, the mosquito fauna changes its character. Except rarely no *maculatus* is found, but swarms of *culicifacies*, *rossi*, *vagus*, *fuliginosus* *barbirostris*, on one occasion the variety *aconitus*. During the rains these water courses must be raging torrents, and probably nothing living therein survives; but after the rains the scour of the spate has left most attractive anopheline breeding places,

* Gotos in 1861 had a population of over 1,600.

† This remark applies also to the villages of the Narur Massif.

‡ Here Dr. Kulke's assistant to the enquiry found in a boy a case of transmission of the viscera.

** This species associated with a protanopheles, at present unidentified, was also taken above-ghât in the rocky nullahs of the low hills.

the danger of which must be considered most carefully

To these streams with their swarms of *culicifacies* or to what other factor is the very high endemicity of these tracts due? Are the hill nullahs responsible, or the paddy fields, or the open surface wells, or a combination of them?

The streams may indeed hold *culicifacies* in large numbers, but the splenic indices shew that proximity to them is not so dangerous as in the hills where *maculatus* lives

The paddy fields probably are not a considerable cause of trouble, any more than they are on the flatter lands of the State, for three reasons —

(1) The malaria season lasts from October to about January in all parts of the State. At this season the paddy fields have been dried off after harvesting so that paddy-anophelines are not so prevalent and would cause less malaria, not more

(2) The variety *acontus* which would probably be the chief culprit is a variety which lives chiefly in the irrigating channels, but when the malaria season starts the irrigating channels are empty

(3) The mosquitoes which were caught in the off-season in a few blocks of irrigated paddy were all only slight carriers, if carriers at all, and it is not likely barring *acontus*, that in the malaria season the mosquito fauna would be different

As for other possible factors in the terrain the evidence of endemicity is unequivocal that the hills and not the flatter land harbour the source of malaria, and as in the hills everywhere the bad carrier *maculatus* was found, presumably this is the main cause of the trouble

3 The broken hilly country distinct from the Deccan spurs

Endemicity—To the south-west, and to the west of the State are tracts of hilly land which are separated by low-lying land from the spurs buttressing the Deccan, for instance the hilly land to the south-west is nowhere connected with the Mangaon-Mansantosh Ridge by land more than 160 ft above sea-level. To the south-west, taking the orientations in order, the country has the reputation of being malaria free, the malaria map showing only one village as slightly malarious (Sherle), while at Madura the spleen-index of the children was found to be 0 per cent. In the western block, so Mr Gawan Taylor informed the writer, "the most astounding increases of population have taken place in recent years", and on the malaria map no place is marked as malarious. The spleen-indices there are — Math 8 per cent, Nerur 4 per cent, Nerurpur 12 per cent, and Sathe Awath 0 per cent

The Anophelines of this section—These tracts in their physical features are characterised mainly by rice-field terraces on the

hill sides as well as on the flatter expanses of country, nullahs running up into the hills and nullahs through the flatter country

In only one hill side nullah was a spring of water found and in its weedy pool *fuliginosus* and *jamesi* were taken. Probably at certain seasons in such situations *maculatus* would also be found but as the splenic indices shew this species is here not a serious thing. In some nullahs on flatter ground *theobaldi*, *rossi*, *jamesi* were captured

From the rice fields, which were for the most part dry, only *jamesi* was taken, in an irrigating channel. Probably the paddy mosquito fauna in general is the same as that found on the undulating tracts already described

Special mention may be made of a tank at Nerurpur artificially formed between some hills. In this tank *fuliginosus* and *jamesi* were found in large numbers, and such a prolific breeding place is likely to cause trouble by sheer weight of numbers, which may account for the fact that here the splenic index was higher than elsewhere

Such malaria therefore as occurs in this division is to be ascribed to species which are not serious carriers or perhaps to serious carriers, e.g. *maculatus*, which are not present in considerable numbers

4 Anomalous Tracts

Reference must now be made shortly to the two somewhat anomalous tracts, lying in the south-eastern and northern corners of the State. Each is of a broken hilly nature, though unlike the conditions in the hilly tracts described above, malaria incidence in them does not assume a uniform character

The south-eastern tract is reputed healthy, and on the malaria-map no village in it is marked as malarious while Mr Gawan Taylor who provides the following population returns, concluded that villages in its eastern (Banda) patha had suffered less than any in the State —

	1881	1901	1921
Talkot	337	492	497
Degwe	665	783	742
Kalne	407	423	388
Khadpade	78	76	47
Fukeri	215	219	211
Kotgar	543	542	590
Asniye	349	339	369
Parpoli	"shows a big increase of population"		

However on visiting such villages the following splenic indices were obtained —

Dhanoli*	73%	Digne	0% (10 children)
Satuli	50%	Degwe	27%
Kesari	95%	Mokgaon	28%
Wafoli	21%	Tamboli	5% (1-20, in boy who frequently went to a malarious town)

* Mr Gawan Taylor says that its population has been stationary for 30 years, a rather remarkable thing with such a high endemic index.

Of these places Dhanoli and Satuli lie definitely at the foot of the Deccan Ghat, while Kesari is situated at the top of a spur of the ghat which is very well seen from Amboli at 2,300 ft so that they are analogous to those described above in section 2. The other villages in the tract with lower splenic indices probably correspond to those in "the broken hilly tracts distinct from the Deccan spurs", for as far as the writer could see they were separated by low-lying land from the ghat or ghat spurs.

The Northern tract appears to be comparable to the South-Eastern. It comprises a block of hilly land some of which definitely buttresses the ghat and some consists of discrete hills. For instance the only malarious villages in the block occur on the Kalsuli ridge, a spur of the Deccan, whereas away from it malaria is not prevalent.

CONCLUSION

In the main the observations above recounted have proved that (1) the slightly undulating land of the State is only slightly malarious, (2) the villages lying along the spurs of the Deccan Ghat are intensely malarious,* (3) those lying in broken hilly ground distinct from the ghat are only very slightly malarious.

Now between the incidence of the disease on plain and hill one might expect to find some difference, but here is a distinction as between two sets of hills, those connected and those not connected with the ghat, although to all appearance the condition of each is the same, with their little patches of paddy and rocky hill-streams coursing down the sides of well-wooded hills.

For an explanation of this paradox the writer must confess that he can only hazard a suggestion. The virulent malaria zone lies along the spurs of the Deccan, and these have above them the whole pressure of the subsoil water of this region the consequence being that the filtrate seeps out all along the foot-hills and admirable breeding-places for anophelines and particularly for the evil carrier *maculatus* arise. The water which springs into the well on the top of Narendra Hill behind Sawantwadi town, probably fell as rain on the Deccan.

On the other hand the broken hilly tracts to the west have lying above them no such filtered from which the hill-foot springs replenish themselves for instance the broken hilly country to the south-west is connected with the rest of the State by land only 160 ft above sea-level consequently nowhere among these

hills can there be a head of water derived from the Deccan plateau of more than 160 ft, and so very little spring water can arise there.

These tracts depend entirely on the local rainfall, and in this way a further reason for the different phenomena in the two zones exists, in that the rainfall in the western hilly tracts is much less than it is near the ghat and the Deccan spurs, and fewer breeding places of surface water are provided. The explanation put forward then is simply hydro-dynamical.

For the rest, evidence to show that the species *maculatus* breeding in the springs of the hills is the chief cause of malaria in the State has been submitted, and this leads the writer to attempt to explain the fact that at very definite dates in certain localities malaria began to assume alarming proportions, that these epidemics have never abated, and have led to great depopulation of the affected areas.

These events were due possibly to the introduction of the species *maculatus* which previously had not been present, or else owing to conditions for its life becoming more favourable, it may have increased enormously in numbers. What natural enemies of *maculatus* might have affected the situation is not known, but a factor connected with the reaction of this species to plant-life supplies a sufficient and it is to be hoped a true explanation.

In 1916 the writer submitted a paper to the Federal Council of the Federated Malay States by order of H. E. the High Commissioner in which it was pointed out that jungle growth is absolutely inimical to the growth of *maculatus*, and in that country this circumstance has led to a regular campaign with magnificent results to keep the swamps, streams and springs, under cover of the natural jungle. Now if jungle be so inimical to the life of *maculatus*, it is not unfair to suppose that the sudden accession of Sawantwadi State was due to the cutting down of the jungle adjoining the villages, probably for the trade in firewood†. A certain amount of colour is lent to this hypothesis by the fact that in villages higher up the ridges, where the jungle has been less disturbed the malaria incidence is lower, and Mr Gawan Taylor, I.C.S. when conversing on the subject made unwittingly what would seem to be two very pregnant remarks he said "what is the matter is the great variation in the jungle."

* It must be noted that this observation in no way corresponds with Majoribanks' finding in Salsette Island where an isolated range of hills rising to 1,500 ft distinct from the Deccan proved very malarious at the hill-foot.

† Another explanation for the epidemics in Sawantwadi town is needed and this is supplied by the fact that here a great tank is formed, around which the town is built (most picturesquely) but this tank has been silting up gradually, so that latterly water-plants which previously could not grow have done so in fact it has become a bed of water-plants, on the surface of which myriads of mosquitoes were breeding.

and speaking of the comparatively malaria-free south-eastern villages he said "generally speaking the country is well-covered with good jungle"*

These hypotheses should be at any rate the basis of preventative measures in the State. If *maculatus* be the carrier which has caused so much harm then the most important measure is to take advantage of what is known of its biology in relation to plant life. For other circumstances standard methods will be followed†. It is fortunate that the main trouble admits of so easy and royal a road to success, the easy stage will make the whole less arduous.

The writer must conclude by thanking Mr G. Laird-MacGregor, ICS, Political Agent of Sawantwadi State, for his very sympathetic administration of the enquiry, and His Highness the Sardesai Maharaj for his great help and the interest he constantly bestowed on the work, an interest which the writer begs to say augurs well for the ultimate outcome of the antimalarial campaign to be undertaken. He is also indebted to Mr Gawan Taylor, ICS, for much information regarding population record. Also to Rao Bahadur M. B. Rane, State Administrator, and Rao Sahib Patankar, State Karbhari, for their efforts to make the carrying out of the enquiry as pleasant and easy as possible.

Mr S. N. Kulkarni, M.B., B.S., Assistant in the investigation must also be thanked for his efficient and cheerful work at all times.

APPENDIX

1 In submitting this appendix of recommendations in more detail, it is presumed that it would be generally impracticable for any inhabitant of the State to remove his dwelling and his being to a more salubrious neighbourhood. The Administration then must ameliorate his condition in his present home, and the measures suggested are here grouped under the three headings—1 Policy, 2 Organisation, 3 Methods.

1 Policy—The policy to be pursued is of course dependent upon finances, but as the cost of prevention of malaria is productive expenditure, it is to be hoped that as large funds as possible will be devoted to the work. The point that such expenditure is productive need not be laboured, the results in Ismailia, the Federated Malay States and Panama shew what can be achieved.

Nevertheless to put in train intensive antimalarial measures everywhere in the State will not be possible, so it is imperative to allocate the available funds to the best advantage.

* But the fact that for the most part this tract is distinct from the Deccan seems to provide sufficient reason for the non-malariousness.

† Details of recommendations are given in an appendix.

Perhaps in the capital town Sawantwadi an intensive campaign may be instituted, but outside it, it seems preferable to conduct some sort of campaign in all the sorely stricken places, rather than a highly-organised one in a few. Results should be forthcoming immediately and the attack can then be continued all along the line, paying special attention to the places of greatest resistance. Coincidentally a spleen index of all villages in the State should be taken for future comparison.

It is suggested that the quinine prophylaxis which has been carried on up-to-date be discontinued. Whatever be the potential value of quinine, in practice it is useless. In Salonica during the war it failed absolutely to protect the troops,‡ whilst an analysis of the seasonal case-rate of malaria in Sawantwadi town shews that the incidence curve has not been affected in the slightest by the use of the drug.

Only when (by rough and ready methods) the general high spleen-index has been reduced, can the remnants of the disease be got rid of by a more refined procedure.

2 Organisation—The control of the work is to be in the hands of a qualified medical man under the charge of His Highness the Sardesai Maharaj who is public-spiritedly determined to eradicate the canker gnawing at the vitals of his State. Under the officer-in-charge it is suggested that there should be a sub-assistant surgeon as assistant, which will allow for contingencies such as leave, sickness or other. A sanitary inspector should be appointed in each of the three *pathas* based on Sawantwadi, Kudal and Banda, and they will have charge of the village work.

This will be conducted by the requisite number of coolies who have been instructed by their superiors in their duties. If in any village one cooly only be required, a literate man with pay at a slightly higher rate than the illiterate man would be preferable at the end of every month he would send in a return of work carried out. Of two coolies employed one should be literate, of three one may be literate, but in this case it would be preferable to place the three men in charge of a *mukadam* (or overseer). Reports of executive work should be submitted every month through the Sanitary Inspector. The inspection of the work should be continuous and thorough, if it is not, the work will not be done, or it will be done according to the illuminating ideas of the coolies, which may be at conflict with Sir Ronald Ross's. Collaterally for 'major works' the State Engineer will be consulted and give his co-operation to the requirements of any situation.

‡ Watson on p. 128 in "Prevention of Malaria" by J. Murray, 1921.

Finally the administrative department should be asked to assist, primarily through the village *foujdars* (headmen), and next through the Circle Inspectors not only in the instruction, after having been instructed themselves, of the executive coolies and *mukadams* and of their *rayats*, but also in the never-ending inspection of the work being done in their jurisdiction. Perhaps it would be feasible to grant a small antimalarial-work allowance to these men on condition of a certain measure of efficiency being shewn in these directions. Where regulations have been framed in aid of the campaign, a few prosecutions should be taken out for non-compliance. The reports of the work sent through the Sanitary Inspectors should be compiled every month and submitted as a report.

3 *Methods*—Methods recommended are (a) local in application, (b) general.

(a) *Local methods*—(1) To be applied to the slightly undulating tracts, vide Section (i).

The beds of the big rivers must be kept tidy. Small pools held up by silt can be filled in with silt, all debris should be taken out and burnt. The devices of local fishermen should be carefully watched to avoid their giving rise to breeding pools, and strict regulations framed that fine mesh fishing nets should not be used.

The tributary nullahs on an earthy bed should be kept clean and cleared of water-weeds, except from the banks, where the vegetation is useful for support and prevention of scour. A chain of small pools on the bed should not be allowed to remain, but a deep narrow ditch cut through them.

(11) *To the tracts about the Deccan spurs*, vide Section (ii).

It is recommended that the hill-nullahs and hill-foot springs, or in fact wherever *A. maculatus* is found breeding, be allowed to revert to their natural condition under a covering of a jungle of plant life. Even the smallest blade of grass seems to have an antagonistic effect upon the well-being of *A. maculatus* and should not be removed unless it is unavoidable. Probably there are no situations in the State where jungle would not cover up within a few months any breeding-place of *maculatus*, but whilst this is taking place some amelioration of the state of affairs would ensue if the breeding places be "trained." The ideal to be aimed at is a ribbon of jungle all along the courses of the streams.

The corollary follows that in such situations no jungle be cut down and in this respect the Forest Department should give a lead. Regulations might be framed to ensure this throughout the State.

(111) *To the hilly tracts which are distinct from the Deccan spurs*, vide Section (iii).

Here the only measure of exclusively local application would depend on the discovery of *maculatus* breeding in the hill nullahs in which case the use of jungle growth must be resorted to.

(b) *General*

(1) *The treatment of ricefields*—The particular danger of the irrigating channels of paddy-fields in-so-far-as in some places they are known to harbour the variety *acomtus* must be remembered. They are therefore to be kept clear and their edges cut straight and freed from weeds.

The fields themselves should be well-banked, filled with as much water as is consistent with the good growth of paddy and that not subjected to a great deal of interchange. Small larvivorous fish and other creatures will then speedily appear and rapidly increase. If there be a constant interchange of water, large numbers of these larvivorous creatures are washed away, while to have the water stagnating would seem an advantage to the crop from a fertilising point of view, but apart from this it appears that the more stagnant the water the fewer are the dangerous anophelines which breed in it.

Fish need not be introduced artificially as the spawn is rapidly carried from place to place on the feet of wading birds, and develops if the conditions are favourable. All paddy-fields should be kept well-weeded, for weeds protect larvæ from their enemies. A most dangerous situation arises when the water on a field is shallow, filled with weeds, and exposed to the sun by poor growth of paddy. In fact it would probably be better for the health of the State if poor paddy lands be not cultivated.

(ii) *Of Wells*—Wells in the State are not incriminated with causing any malaria, yet it would be advisable to stock them all with larvivorous fish. The malaria medical officer should have an aquarium in connection with his office where a sufficient supply of fish would be available. The village officers should be directed to send in a return of the number of wells in their villages and the fish distributed accordingly.

(iii) *Of tanks and pools*—Such collections of water are not dangerous when kept free from weeds and of a sufficient depth of water. They must therefore either be carefully conserved or drained away. Netting of all fish of over a certain size should be encouraged so as to save larvivorous fish from destruction.

Shallow shelving uneven edges are protective to larvæ, and they must be cut clean and deep. A small pool may be filled up, or after being tidied up, sprayed with a mixture of crude oil and kerosine, (4 parts to 1) from a knapsack sprayer*.

* Good knapsack sprayers are obtainable from Messrs Leslie & Co., Chowringhee, Calcutta.

(iv) *Of drains and ditches*—Should any swampy ground be drained by open ditches it is very necessary that the antimalarial officer should see that no bad malaria carrier breed in them. This is especially important in the *maculatus* zone. If bad carriers are found the ditches should be swept out with stiff brushes once a week and oiled (*vide para m supra*). A deep narrow ditch is not likely to lead to trouble whereas a shallow, broad one is.

(v) *Pisciculture*—Fish should play a prominent part in the measures to be undertaken. Some situations in which they would be useful have already been indicated. Tanks for breeding different species should be constructed at the laboratory of the Officer-in-charge. The water in them should be shallow and flowing and the natural insect food supply encouraged by an artificial bank of water weeds and grasses, but this food should be supplemented by a little finely chopped meat which should be kept constantly changed. As mentioned elsewhere the natural protection of these little fish can be ensured to a great extent by netting all fish larger than themselves.

(vi) *Of rocky nullahs*—Rocky nullahs in the hills are dealt with above in the local treatment of the tracts about the Deccan spurs, but when they debouch on to flatter ground and *maculatus* disappears, they must be subjected to different measures. It is best to "train" them. All potholes on the rocky surfaces must be filled with concrete, all other irregularities in the stream bed straightened, debris removed, the banks tidied and supported by a growth of vegetation small and big and in general any mechanical principles applied to ensure the stream flowing evenly and as deeply as possible.

WHAT ARE THE DEPARTURES FROM HEALTH AND THE DISEASES WHICH ARISE FROM THE NEGLIGENCE, IGNORANCE AND SELF-INDULGENCE OF MAN?

By J W CORNWALL, M A, M.B., D.P.H.,

LIEUT.-COLONEL, I.M.S.

HERE we begin an enquiry which has at present no finality, for though it is generally recognised and admitted that the voluntary conduct of a man is directly responsible for laying the foundations of certain types of ill-health yet we have comparatively little exact knowledge of the matter and can speak only vaguely.

The leave and pension rules of Government penalise to some extent those Government servants whose disabilities are acquired through avoidable errors of living which were not imposed on them by the exigencies of the public service. So there is State recognition of the fact that a man's ill-health in certain circumstances may have been

caused by his own conduct over which he had at the time full control.

This seems to be the only instance in our modern world of the condemnation of ill-health. Ill-health from whatever cause expects and generally receives sympathy. A man may be pursuing a course of life which all his friends know, even if he himself chooses to ignore it, must end in a breakdown sooner or later. They may say "What a fool so and so is to go on as he is doing!", they may endeavour to dissuade him from his courses but ostracize him or otherwise show disapprobation, never! When the inevitable breakdown comes, sympathy for the man is shown and perhaps sympathy of a practical nature for those dependent on him. Public condemnation is limited to saying "how foolish!" and such conduct is not regarded as a crime, a social sin which merits punishment as much as any other sin against the community. The resulting ill-health and all its consequences are regarded as sufficient punishment.

Ill-health from any cause, voluntary or involuntary, brings punishment with it to the sufferer in the shape of poverty and loss of the amenities of life. It is a biological, if not a man-made social law that no downward departure from the normal lacks its attendant punishment.

We cannot here discuss whether risks taken are worth while or not, whether ten years of intensified effort followed by a breakdown are worth more to the individual or to the community than thirty years of less intense effort followed by no breakdown. It is certainly true that a great force acting for a short time may accomplish something which a lesser force, even though it act for a long time, might never accomplish, and it is for the future to decide whether voluntary breakdowns are to be condemned as sins against the community and whether the community should accept the voluntary sacrifice of individuals for the apparent general good. One thing at least seems clear, a voluntary breakdown for a purely individualistic and selfish motive cannot on any ground escape condemnation.

These particular points do not, however, affect the main issue. It is comparatively seldom that the good of the community as a whole is dependent on the efforts of an individual. We are here concerned with the widespread ignorance and indulgence of mankind which results in much ill-health, misery and distress, and lessens the total sum of the happiness and the wealth of the community.

Let us go over the question systematically and see, if we can, what individual man can do to avoid disease and remain healthy.

Comparatively few children, perhaps 30 per 1,000 births, are born so defective that they cannot survive for long. Thus the totally unfit are speedily eliminated and the remaining 970 ought, accidents and disease apart, to live out the natural term of life. Our knowledge of ante-natal influences and ante-natal pathology is not yet sufficient

to permit us to suggest that it will ever be possible to guard against congenital defects, so we need here consider only the position of the 970

All of these children derive certain characteristics from their progenitors. Some of these inherited characters are beneficial such as good physique or acute intellect, others are apparently indifferent such as pigmented skin or hairiness, others are prejudicial such as albinism or hæmophilia. Inherited characters cannot yet be classified definitely as good, bad or indifferent and it is not known exactly what characters can be inherited. Still less practicable is it to arrange the elimination of the bad and the perpetuation of those that appear to be good. Anyhow no one can do this for himself, and when he comes to an age of understanding a man must order himself as he finds himself constituted. During his childhood, accidents apart, all responsibility for the maintenance of the health he was born in rests with his parents as far as individual effort can go. Gradually as he reaches years of discretion the responsibility is transferred to himself and it is then that the influence of good early training in hygiene may begin to be felt.

Let us assume that our typical man has been born with a healthy constitution free from any hereditary deviation from the true metabolic mean. We must grant that the metabolic balance is more delicately adjusted in some persons than in others, that an influence which would visibly depress the pan in one would scarcely suffice to tip the beam in another. Can a man so regulate his life that the pan of his metabolic balance remains stationary at the mean point or merely swings gently up and down, sometimes a little above the mean sometimes a little below it?

All symptoms of disease have their origin in some disturbance of the bodily metabolism, some alteration in the physico-chemical processes which are the accompaniment of perfect health. Whenever a man becomes aware of any deviation from his state of perfect health it is an indication of some derangement of his metabolic processes. Metabolism can be deranged so to speak negatively, by the absence of some necessary factor from the food or the environment, and positively by the addition of some harmful factor to the food or the environment. Positive derangement is perhaps more frequent than negative but the two influences often co-exist.

Unquestionably it is possible for a man, given intelligence, self-control and the will to succeed, to regulate his diet, conduct and environment in such a way that, excepting influences beyond his individual control, he will maintain his health perfect throughout his life, but we do not yet know how far this hypothetical man will be immune from specific infections by reason of his perfect health. Until this point is cleared up it must remain in many instances a matter of speculation whether a man is personally to blame for having acquired a disease arising from infection with a specific organism. We are postulat-

ing intelligence and considerable knowledge in our man. Barring accidents he should be able to keep free from ordinary pyogenic infections, he ought to be able to avoid cholera, dysentery and enterica, Malta-fever, plague, tetanus, anthrax, glanders, leprosy and gonorrhœa should have no terrors for him. Tuberculosis is perhaps a greater risk, but though we do not know whether perfect health does or does not connote immunity, it is certain that intelligent care will avoid many sources of infection. The causes of dental caries are not yet clear, but at least no one need get pyorrhœa or chronically infected tonsils. The case for pneumococcal infections of the lungs, sinusitis, otitis is not so obvious. The agents are always with us but it is doubtful if they can establish themselves except as sequent to a preceding lesion which might have been avoided.

We do not know the relation between the health of a population and the incidence of epidemics, whether a population becomes predisposed towards infection or whether the agent has periods of rapid multiplication and enhanced virulence. Consideration of pandemics of influenza is outside the scope of this article.

Our man should be able to avoid all fungoid invasions of the skin and tissues or at least to eradicate them as soon as recognised. Protozoal invasions can likewise be avoided such as malaria, trypanosomiasis, leishmaniasis and syphilis.

Metazoan invasions by flukes, nematodes, filariæ, hookworms and tapeworms are all within the control of the individual.

Infective disorders of doubtful etiology are naturally more difficult to guard against, but here intelligently exercised care on general principles can do a great deal.

I do not give heed to the possibility of artificial immunity being established by vaccination against one or several sources of infection, for however useful such methods may be, they have their obvious limitations and will undoubtedly in time be superseded.

I may pass by the long list of metabolic and mechanistic disorders of the organs of the body which are the immediate or remote results of some antecedent bacterial or parasitic infection, for these have already been dealt with in the foregoing comments on the practicability of avoiding infections, and one need scarcely dwell on the fact that if the infection can be avoided its remote consequences do not arise. Without an amœbic infection of the gut a man does not develop an amœbic abscess of the liver, without an infection with syphilis the protean manifestations of tertiary syphilis do not occur, without a pyogenic infection of the female genitals there is no salpingitis, and so on.

We come next to a long list of metabolic disorders, gout, diabetes, the anæmias and blood disorders, disorders of digestion and assimilation, of the liver, pancreas and kidneys some of which may yet be shown to be sequent to an infection.

while others are primarily disturbances of function

How can function be disturbed? I can think of only four ways (1) Inherent weakness which allows a breakdown under ordinary usage, (2) improper supply of energy, (3) clogging by imperfect removal of waste, (4) mechanical interference from without

Inherent weakness may be ruled out of the present discussion which is not concerned with heredity and pre-natal influences. Improper supply of energy in the form of food is unquestionably at the root of most derangements of function. The food may be unsuitable in quantity or in quality and its digestion may be interfered with by insufficient mastication, bad cookery and other external means. The elimination of waste may be hindered by sedentary habits and a variety of external causes. Purely mechanical influences, such as constriction, compression and displacements may interfere with the blood supply of any part and its due nutrition and oxidation. Need a man get disease of the heart? The heart's efficiency may be lowered by changes in the nervous mechanism which governs its beats, by changes in its muscle fibres themselves, by defects in its valves leading to changes of pressure in its chambers, by defective nutrition of its muscles, by changes in other parts of the body leading to alterations in the normal pressure in its chambers and by overstrain of its capabilities, by voluntary or involuntary bodily exertion.

Disease of the myocardium is secondary to infections. Acute endocarditis is sequent to rheumatic fever, the eruptive fevers and other infections. Chronic endocarditis is sequent to chronic intoxications, lead, alcohol, syphilis, gout. Arterio-sclerosis may be sometimes simply a manifestation of senility but more generally it is the result of a chronic intoxication. Aneurysm follows acute and chronic infections often coupled with strain.

It is quite clear that practically all disease of the heart and circulatory apparatus is secondary to infections and intoxications some of which are entirely within the power of the individual to avoid, others of which we do not yet know how altogether to avoid. The incidence of disease of the heart can therefore be largely reduced in the immediate future simply by right living, and can be practically eliminated from the list of ills man is now subject to when it is possible for him to guard himself more closely from various infections.

Need a man have disease of the kidneys?

Malformations are outside the scope of this paper.

Movable kidney is acquired and secondary to some other derangement.

Some kidney disorders are secondary to circulatory disturbances.

Acute nephritis is due to exposure, the toxins of acute specific fevers and to chemical irritants.

Chronic parenchymatous nephritis follows acute nephritis or develops insidiously after other ailments. Chronic interstitial nephritis follows the parenchymatous nephritis, chronic intoxications or is associated with arterio-sclerosis. Amyloid disease is a sequent of other forms of nephritis or of general toxic conditions. Pyelitis is secondary to infections of other parts. Hydronephrosis follows mechanical obstruction. Stone in the kidney is due to some metabolic disturbance. It is evident that if specific fevers, metabolic and cardiac disorders, chronic intoxications and pyogenic infections can be guarded against there need be no disease of the kidneys.

In fact when we scrutinize the diseases or derangements any of the organs is subject to, whether it is the nervous system, the respiratory system, the digestive system, the liver, the kidneys, the spleen, the circulatory system or the locomotor system we find that the bulk of these diseases is dependent on a train of events which need not have occurred. Some are secondary to disease of other organs, many are the direct result of specific infections with vegetable or low animal organisms, others are dietetic in origin, some are occupational, some are dependent on external agencies and the complexities and emergencies of modern life. In comparatively few can one or more of the above agencies not be traced. It must be admitted that the nature of some disorders is as yet quite unknown and these are therefore beyond the reach of foresight to prevent. Still we need not trouble about the rarity, it is the commonplace which should occupy attention in the first instance.

The medical profession individually and collectively should never cease trying to make every one realize, the illiterate, the educated, the man in the street and, above all, the politicians and the leaders of the nations that sufficient knowledge has been accumulated to enable a large part of the ill-health that man customarily suffers from to be avoided in future generations, if not in the present. Most people now accept disease as an unavoidable misfortune, not knowing that it is in many cases the direct result of their own ignorance or negligence and in most of the others the direct result of the ignorance and negligence of those whom fate has made the leaders of their nation. When people understand that all or nearly all disease is preventable or avoidable and that the physical suffering, disablement and economic loss which accompany and follow illness are not the inevitable lot of mankind, then perhaps there will be a more widely expressed desire to live life as it ought to be lived. It is the duty of the medical profession to arouse that desire and to propagate the knowledge which will in time permit the desire to be satisfied.

It is far more pathetic that the world should accept ill-health with resignation, unaware of brighter possibilities, than that a nation should be content to live with a dormant political conscience.

THE USE OF A NON-MOTILE STRAIN OF *B TYPHOSUS* IN THE AGGLUTINATION REACTION

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Many instances of "infection from irregular strains of *B typhosus*"¹ are on record and the diagnosis of these cases, if the bacilli are not recovered from the blood, faeces, or urine, is difficult by the agglutination test, where the patient's serum is treated with only one standard laboratory strain of *B typhosus*, the reason for this difficulty being that the serological differences between the standard laboratory strain and the irregular strain causing the infection may be so great that at the time when the diagnosis is attempted, the patient's serum may have produced agglutinins for the causative strain but not for the standard strain. Every case of *B typhosus* infection should be diagnosed by finding the organisms in the blood or the faeces long before the agglutinins are developed, but it is known that one may fail to discover the bacillus either in the blood or the faeces even by repeated cultures under certain conditions, and further the cultural methods may not be applicable. So in some cases the agglutination reaction becomes a necessity for diagnosis.

The technique for this agglutination test has been highly improved, especially by Professor Dreyer. Even if Professor Dreyer's technique be employed there is a small percentage of cases where the test may be negative though the cases are typhoid as proved by previous cultural results or by definite clinical signs. It struck me a short time ago that this might be due to the fact that I used only one strain of *B typhosus* (in addition to the Paratyphoid strains) in my routine work. This has been borne out by practical experience in observations on several consecutive cases. I propose to discuss briefly only those necessary to illustrate the point at issue, other details of the cases are omitted.

The technique of the agglutination reaction employed has been that perfected by Professor Dreyer. Formolised emulsions prepared from broth cultures and standardized by opacity have been used².

The following are short notes on the cases, all of which were admitted and treated in the Medical College Hospital Calcutta.

Case No 1—A Chinese female (aet 18), admitted on the 12th day of fever with temper-

ature 102°, shortly after admission blood faeces, and urine were cultured, all were negative, the agglutination reaction performed on the 14th and 24th days of disease was negative to *B typhosus* and *B para-typhosus A* and *B* in the following dilutions

	10	25	50	83	125	C
Tcal	—	—	—	—	—	—
Tk	—	—	—	—	—	—
Para-A (K)	—	—	—	—	—	—
Para-B (K)	—	—	—	—	—	—
Tk—Kasauli strain	—	—	—	—	—	—
Tcal—Calcutta strain	—	—	—	—	—	—

Clinically the patient was running a typhoid course. Faeces cultured a second time gave a Gram-negative bacillus, a broth culture (24 hrs) showing most of the organisms to be non-motile and a few sluggishly motile. The cultural reactions were those of *B typhosus*. The organism was agglutinated by the high titre serum (from Kasauli) to a dilution of 1 in 20, and by the patient's serum up to a dilution of 1—80. I reported it *B typhosus*, the patient went through a typical course of typhoid, 5 days later the patient's serum agglutinated its own strain up to 1—160. This patient's serum never agglutinated the other strains we had in the laboratory at that time, viz, the Kasauli strain and some freshly isolated agglutinable strains from the blood of local typhoid cases.

Case No 2—A European female (aet 40) running remittent swinging temperature. Urine was first sent for *B coli*—in it was found a bacillus, a 24 hours' broth culture of which consisted of a mixed population of non-motile and feebly motile Gram-negative bacilli, which gave the cultural characters of *B typhosus* but which was not agglutinated by the high titre serum (from Kasauli) nor by the patient's own serum on the first occasion. It was agglutinated by the serum of case No 1 and by this patient's serum at a later date. The serum of the patient never agglutinated the other strains, but only the autogenous strain and the strain from the faeces of case No 1 at an advanced stage of the disease. This gave rise to the suspicion that it was a fairly common local strain, not found everywhere. This patient ran a course of enteric clinically—the temperature was of a swinging character all through.

At this stage Capt G Shanks, M.D., F.R.S., Professor of Pathology, Medical College Calcutta (to whom I am much indebted for help and advice at all stages of the investigation), and who is interested in the serological differences between various strains of *B typhosus*, gave me two other strains of *B typhosus*—one the Lister strain (Tl) and the other a strain from Nainital (Tnt) (Source—R. A. M. College, Millbank).

Under the direction of Capt Shanks the production of specific agglutinating sera was

¹ Journ. Inf. Dis., Vol 27 1920 p 46 "Meyer & Neilson"

² Special report series No 51 Medical Research Council

also begun at this stage—the method used being that of Bainbridge³

The Lister strain corresponded as regards agglutinability with the Kasauli strain and several other strains isolated here from typhoid patients, whereas the Naimital strain was practically non-motile and corresponded with the two strains isolated from cases Nos 1 and 2

Gardener and Walker¹ have recorded serological differences between motile and non-motile strains of *B. typhosus*. After consideration of my observations and those of Gardner and Walker, I decided to use two strains, TI and Tnt, in my routine agglutination test. It was interesting to find that most of the positive typhoid sera nicely agglutinated the Lister strain but did not touch the Naimital strain—nor the two strains from cases Nos 1 and 2. A few of these positive typhoid sera agglutinated both the strains—though the Naimital group to a much less degree.

Case No 3—A Chinese boy (aet 14) admitted on the 4th day of disease clinically labelled “enteric.” Blood culture just after admission—sterile, faeces—culture negative.

Blood on the 11th day of the fever agglutinated Tnt up to 1-125, but not the Lister strain.

	25	50	83	125	C
TI	—	—	—	—	—
Tnt	+	+	+	+	—
AI	—	—	—	—	—
BI	—	—	—	—	—

I cultured the blood again and recovered the organism in pure growth. I was searching carefully for this strain in the blood stream. This strain was practically non-motile (in broth culture only a few bacilli showed slight motility) and was agglutinated by the patient's serum and corresponded with the Naimital group of strains. It was agglutinated at a low dilution only by the TI high titre serum prepared in our laboratory. The patient's serum never agglutinated the Lister, Kasauli and other corresponding strains. Its highest titre for the patient's own strain and for the Naimital strain was 1-500.

The patient ran a typical course of typhoid, convalescence was uneventful, and he was discharged from hospital, cured.

Case No 4—A Hindu male (aet 21) clinically enteric, blood examined for agglutination test on 10th day of fever—

	25	50	83	125	C
Tnt	+	+	+	+	—
TI	—	—	—	—	—
AI	—	—	—	—	—
BI	—	—	—	—	—

Case No 5—A Hindu male, clinically enteric, agglutination test (12th day of disease)

	25	50	83	125	C
Tnt	+	+	+	+	—
TI	—	—	—	—	—
AI	—	—	—	—	—
BI	—	—	—	—	—

A week later

	25	50	83	125	250	500	C
Tnt	+	+	+	+	+	+	—
TI	—	—	—	—	—	—	—
AI	—	—	—	—	—	—	—
BI	—	—	—	—	—	—	—

Case No 6—Indian Male (aet 25) clinically enteric. Blood culture—*B. typhosus* (Naimital group). Patient's serum agglutinated the auto-genous strain and the Naimital strain as follows—

	25	50	83	125	250	500	C
Tnt	+	+	+	+	+	+	—
T autogen	+	+	+	+	+	+	—
TI	—	—	—	—	—	—	—
AI	—	—	—	—	—	—	—
BI	—	—	—	—	—	—	—

Case No 7—A European male—running a low remittent temperature. Culture of blood, stool and urine all negative. Agglutination test—

	25	50	83	125	C
Tnt	+	+	+	+	—
TI	—	—	—	—	—
AI	—	—	—	—	—
BI	—	—	—	—	—

At this stage a serum showed doubtful agglutination with Tnt, and the Tnt culture from which the emulsion was prepared was found to have developed a fair number of motile elements. From this was prepared a culture consisting of a non-motile population only, and the emulsion prepared from it gave a positive reaction with the above serum, which was doubtful before. I now always use an emulsion from an absolutely non-motile strain. During the past twelve months a diagnosis of *B. typhosus* infection has been made in eleven cases by using this non-motile strain. In none of these cases was the motile strain (Lister) agglutinated even in dilutions as low as 1-25.

The serum of a rabbit inoculated with TI gave the following results—Highest dilution showing standard agglutination with TI=1-16,000, with Tnt=1-166. With para A and B=negative in all dilutions from 1-25 upwards.

The serum of the rabbit treated with Tnt showed agglutination with the homologous strain only up to 1-500.

Another rabbit inoculated with Tnt gave the following results—Highest dilution showing standard agglutination with Tnt=1-1,666. Highest dilution showing standard agglutination with TI=1-50. With para A and B=negative in all dilutions from 1-25 upwards.

³ Practical Bacteriology, Microbiology and Serum Therapy—1913, p 436 “Besson.”
⁴ Journal of Hygiene Vol XX 1921

Absorption Test—The T1 serum referred to above, when saturated with T1 emulsion left behind no agglutinin either for the T1 or the Tnt strains, whereas the same serum saturated with Tnt emulsion left no agglutinins for Tnt but agglutinated T1 up to a dilution of 1—5,000

The Tnt serum (which showed its highest titre for Tnt as 1—1,666) saturated with Tnt left no agglutinin for either Tnt or T1, but when saturated with T1 left none for T1 and showed doubtful agglutination only in a dilution of 1—25 with Tnt. The other local strains have not been fully worked out as yet but their investigation is being carried on

Conclusion—In the agglutination test undertaken for the diagnosis of enteric infections, it seems to me essential to use a non-motile strain of *B. typhosus* in addition to the other organisms ordinarily used

SPINAL ANALGÆSIA

By F J W PORTER,
MAJOR, DSO, R.A.M.C. (Retd.)

I HAVE lately read several articles on the above subject and have noted that one of the greatest objections to its use is the initial fall of blood-pressure which may be produced by the drug itself (Stovaine)

It is common to find within three minutes after injection that the face becomes very pale and the pulse soft and feeble. Vomiting may also ensue. There appears to be no doubt that this drug (and probably all substitutes) causes dilatation of the blood vessels, and considering that the abdominal vessels can hold all the blood in the body, such dilatation may cause alarming symptoms or even death in old and feeble patients. I therefore thought it advisable to inject 10 minims of adrenalin intramuscularly about three minutes before introducing the spinal injection. This is on the same principle that one has for many years adopted of giving adrenalin before injecting any of the preparations of salvarsan. By the time that the latter drug reaches the brain, the adrenalin has caused contraction of the cerebral vessels and so defeats the dilating effects which salvarsan undoubtedly has.

Although I have used spinal analgæsia for the past eleven years to the practical exclusion of general anæsthetics, I have not yet had a sufficient number of cases to enable me to say whether this preliminary injection of adrenalin has had the effect one supposes it to have, but I have recently operated on 2 or 3 men whose condition was extremely bad and they stood the operation remarkably well. There is no doubt that a preliminary injection of morphia and hyoscine must be given if one is to eliminate the possibility of shock taking effect through the special senses.

One of my nurses told me that she had seen a number of operations performed under spinal analgæsia in a large provincial hospital in England and that all the patients got shock. She said

however, that none of them had been given a preliminary injection of morphia and hyoscine, and they were naturally acutely conscious of what was taking place.

Even the most courageous patient must suffer from shock under these circumstances. These remarks apply also to cases who are to have general anæsthesia, and there is no doubt as to the value of a large dose of morphia in those who are to be operated on under local anæsthesia.

I invariably remove the breast by Halstead's method practically entirely under local analgæsia, assisted by heroic doses of morphia and hyoscine. I have lately returned to the ampoules of Stovaine-glucose which are put up by Poulenc Freres (Stovaine Billon) and have had considerably fewer headaches than with locally prepared preparations.

The diffusion of Stovaine-glucose is rapidly completed and there is no danger in putting a patient in the Trendelenburg position soon after the injection. I prefer to open the abdomen first and then raise the pelvis if necessary. I think it is a great pity that this method of analgæsia is not taught and practised in all the medical schools and affiliated hospitals in this country, especially when one knows what can be done with it in isolated places by surgeons who have no competent anæsthetist.

A Mirror of Hospital Practice.

A CASE OF HOMICIDAL YELLOW OLEANDER POISONING

By SAURANGANATH BANERJEA, M.B.
Chief Medical Officer, Dhenkanal

ON the 15th January, 1922, the dead body of a Hindu male cultivator, aged 23 years, identified to be that of Ankul Sahu, of Oulakota, Perjang Bisa, Dhenkanal (Orissa), was brought to me at 2 p.m. for post-mortem examination by the police. The body was sent from Motanga outpost at 10 p.m. on the 14th January, 1922. The post-mortem examination was performed at 3-30 p.m. on the following day.

Information furnished by the police was that the deceased on taking a meal of *pakhal* (stale rice) and bean curry given by his wife, with whom he was not on good terms, began to vomit and died within about 2-3 hours after taking his food in the evening. The deceased complained of unnatural pungency of taste of the bean curry immediately after taking it and suspected foul play on the part of his wife. The following symptoms appeared before death:

- (1) The deceased felt a burning sensation like that produced by taking raw red chillies in the mouth soon after taking the bean curry.

- (2) Loss of sensation in the tongue and pulling it inside
- (3) The deceased felt blindness of the eyes
- (4) Vomiting
- (5) Sense of extreme weakness
- (6) Unconsciousness

Post-mortem appearances were

Body well nourished
R.M. present in lower extremities and disappearing in upper extremities

Pupils dilated

Fingers and toes shrivelled

Lips livid and black

Brain congested

Lungs normal, no adhesions

Right ventricle of the heart contained dark fluid blood and an ante-mortem clot inside the cavity. Left ventricle empty

Right auricle full of dark fluid blood

Left auricle empty

The stomach contained almost undigested solid particles of rice and beans. The contents were yellowish-white in colour and had no peculiar smell. The stomach was in folds especially along the posterior surface and greater curvature. Mucous membrane congested with much thick tenacious mucus adhering to it.

The small intestine contained pale yellow mucoid chyme and was not congested.

The large intestine contained semi-solid pale yellow feces and was also not congested.

Liver congested, gall bladder filled with golden yellow bile

Spleen soft

Kidneys congested

Organs of generation normal

Urinary bladder healthy, filled with about 4 oz of pale yellow urine.

The first information furnished by the head constable of the police outpost along with the dead body was very meagre, detailing only that the deceased died within about 2-3 hours after taking food given by his wife with whom he was not on good terms. A week after my post-mortem report was submitted a detailed report of the investigation by the police inspector was obtained and I suggested poisoning by yellow oleander after taking into consideration the symptoms furnished by the police, the post-mortem appearances and the fact that in Orissa poisoning by yellow oleander is common.

Two packets of powders were recovered by the police one from the waist of the deceased's wife and the other from the possession of the wife's aunt (father's sister) who was also an accomplice in the murder.

The two packets and the gastric contents of the deceased were sent to the Chemical Examiner for analysis and oleander was detected in all of them.

The medico-legal interest of the case lies in that the case furnishes many data regarding yellow oleander poisoning, viz—

- (a) The taste of the poison hot and pungent
- (b) The purpose for which the poison may be used homicidal
- (c) The place where it is commonly used,

as is evidenced by a knowledge of its poisonous nature by illiterate low caste cultivator women of a very out-of-the-way and backward place in Orissa

- (d) The mode of administration of poison internally through coloured spicy food such as curry
- (e) The fatal period within 2-3 hours from administration of poison
- (f) The interval that takes place between administration of the poison and the first appearance of symptoms almost immediately after taking the poison
- (g) The symptoms produced after administration of poison

(1) Pungent and burning sensation in the mouth

(2) Vomiting

(3) Dryness of the tongue and throat, giving rise to a sensation of pulling inside of the tongue

(4) Dimness of vision

(5) General debility, dizziness and unconsciousness

(6) Purging, as evidenced by faecal matter adhering near the anal and gluteal regions of the dead body

(h) Post-mortem appearances Engorgement of the venous system, fullness of the right side of the heart with ante-mortem clot. Congestion of the brain, liver, kidneys and stomach with much tenacious mucus adhering to the gastric mucus membrane

(i) Nature of the poison ante-mortem clot within the heart cavity indicating heart failure shows the action of the poison on the heart

TWO CASES OF DEATH FROM HÆMORRHAGE INTO THE PERICARDIUM

By R. S. TOWNSEND, M.C., M.D.

MAJOR, I.M.S.,

Civil Surgeon, Jhansi

The following two cases were received for post-mortem examination within a few days of each other. As they were both received from Headquarters detailed examination was possible. Though the outward signs were similar, namely a pericardium full of recent blood clot, the cause was found to be different—

Case A showed actual rupture of the heart muscle

Case B showed rupture of a small aneurism in the first part of the aorta

Case A Mahomedan male, aged about 45, a shopkeeper, fairly well developed. No history of recent illness. Lived a sedentary life. He went to draw water in his *lotah* from a well at daybreak and fell back dead. On opening the chest wall the pericardium was found distended with recent blood clot. Both lungs were engorged and a few

adhesions were found at the left apex. The pericardium was opened, the blood clot carefully washed out and the heart removed.

It was not markedly enlarged and weighed 11 ozs. The muscle fibres were soft and of a brownish colour. At the point of entrance of the pulmonary artery into the right ventricle, there was a rupture $\frac{3}{4}$ inch long stretching into the cavity of the ventricle. No disease of the valves could be found, one minute patch of atheroma was present in the pulmonary artery about 1 inch from the tricuspid valves, otherwise the large vessels seemed healthy. All other organs of the body were healthy except the liver, which was enlarged and somewhat engorged. Portions of the heart muscle sent for examination were unfortunately lost.

The literature on rupture of the heart in ordinary text-books is meagre, but the left ventricle is given as the commonest site of rupture. In this instance it would appear that the case was one of degenerative myocarditis probably of specific nature. It seems to me extraordinary that with such an advanced disease the man should have lived his normal life.

Case B The second case, brought three days later, was that of a Mahomedan male, aged about 60, who became suddenly unconscious and died in a few hours. There was a history in his case of pain in the chest for several months, and he had been taking treatment. The body was sent as his relatives wished to know the cause of death. In his case from the history I thought I was probably dealing with a case of cerebral hæmorrhage.

On opening the chest we found the same outward conditions as in Case A, the pericardium filled with blood clot and the lungs engorged.

On carefully removing the heart I found that the cause of death was rupture of a small aneurism about the size of a marble situated in the first part of the aorta, just above the orifice of the coronary artery. The whole of the aorta was a mass of atheromatous patches, markedly calcareous in places. The coronary artery was very brittle and broke like a piece of glass tubing whilst being dissected out. The arteries all over the body showed marked thickening. The heart was enlarged and weighed 16 ozs, left ventricle hypertrophied, kidneys small and red, capsule thickened. All the evidence pointed to disease of the arteries, probably of specific nature, being the cause of the atheroma.

In Case A the action of the toxin seems to have fallen on the muscle of the heart and in the second case on the arterial system. The smallness of the rupture accounted for the man living a few hours in Case B.

THE BENGAL FORCEPS

A MODIFIED OBSTETRIC FORCEPS FOR USE IN BENGALI WOMEN

By DR KEDAR NATH DAS M.D. (Madras)

It has been found by pelvimetry that the average measurements of the pelvis in Bengali

women are about $\frac{7}{8}$ ths of those of British women. The average weight of a Bengali full-term baby is about $\frac{6}{7}$ ths the average weight of a British baby, while the size of the head of the former is proportionately smaller. Moreover, owing to social customs, pregnancy supervenes at a comparatively early age in Bengali girls. The use of forceps manufactured on British standards upon Bengali women thus frequently causes injuries to the mother.

The above considerations led me to modify the ordinary Simpson type of forceps so as to adapt it for use in Bengali women. Two types have been devised—the ordinary and the axis-traction.

The ordinary type of modified forceps—the “Bengal forceps” as it may be aptly called, is lighter and more delicate than the ordinary

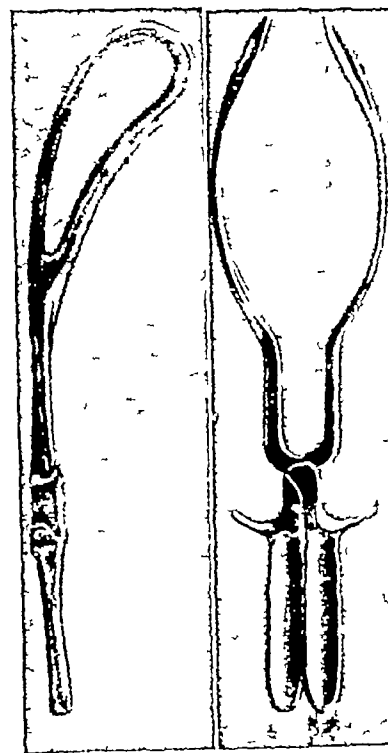


Fig 1 —Das's Bengal Forceps Ordinary type

models in general use. While the weight of a pair of Anderson's forceps is about 1 lb 10 ozs the “Bengal forceps” weighs only a pound. In the “Bengal forceps” pelvic curves are a little more pronounced than usual and the distance between the shanks near the joint is wide enough to admit the forefinger. The handles are made like those of amputation knives, and give an efficient hold without adding much to the weight of the instrument. Moreover, being flat they allow the thumbs to rest as a fulcrum very effectively during the final stage of extraction of the head. The shoulders which have been made as small as possible, merge gently into the handles so as to allow the operator's fingers to rest comfortably.

In the axis-traction model the blades are fitted with detachable axis-traction rods

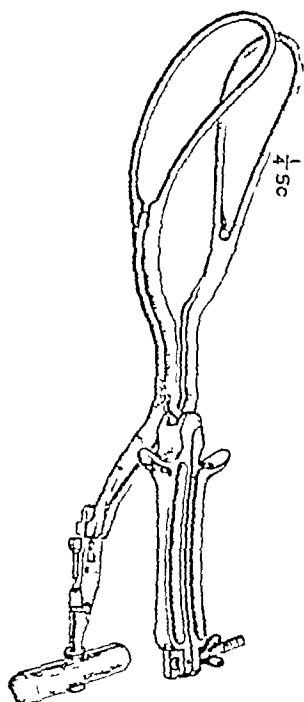


Fig 2—Downs Beng 1 Forceps Axis Traction type

which are supplied with Down Bros registered catch. The traction handle (hollow) is about 3 inches long and is made as light as possible. At the lower end of the handle of the left blade there is an adjusting screw with a butterfly nut which is received into a grooved ring attached to the lower end of the handle of the right blade.

It may be mentioned that the modified forceps will be found to be suitable and useful in Indian women generally.

Both types—ordinary and the axis-traction—have been manufactured by Messrs Down Bros of London from specifications supplied by me in 1912. During the past ten years they have been in frequent use by myself and numerous other Bengali practitioners. Unquestionably they have been found to be more useful and less harmful in Bengali women than the other usual types obtainable at the surgical instrument makers' shop.

PERSONAL OBSERVATIONS ON A FEW CASES OF KALA-AZAR

By D N ROY, M.B., D.T.M., (Calcutta),
Asst Professor of Entomology, School of Tropical
Medicine Calcutta

I intend to bring before the readers of this journal a few notes concerning my personal observations on 26 cases of kala-azar seen in Purnea, the notoriety of which place is well known. Purnea is said to have been a place of deportation during the time of the Nawabs. Although the climate has materially improved of late I think it is still bad enough to frighten a new comer.

The border districts are Nepal on the north, Bhagalpur on the west, Dinajpur on the east and Sonthal Parganas on the south. The water supply is mainly from shallow wells, 10 to 12 feet deep. Small hilly rivers intersect the district every where. There is abundant rainfall and great humidity of the atmosphere.

The disease occurs in Purnea in sporadic form and except in three instances I did not find it affecting more than one member of a family. Out of 26 cases, six were females and the rest males, except in three cases the age incidence was below 16 and over 2. The youngest of my cases was 2 years old. One particularly remarkable thing about this disease is that the healthiest looking boy whom the parents do not consider will ever contract kala-azar is often a victim of this malady. In this connection I may point out that the dwelling houses of the affected people are situated on damp, moist earth surrounded on all sides by trees. An enquiry as regards the keeping of domestic animals showed that the animals found were cows and goats and in some cases there were horses tied outside in the compound. No particular insect was found to be in abundance in the kala-azar houses.

The onset of the disease has been said to be insidious. I had the opportunity of treating three cases in particular whose mode of onset I could definitely ascertain and whose subsequent symptoms I could trace, as these patients were from the beginning under my treatment.

The first case I saw was a girl aged about 9, who, previous to this illness was quite healthy. She had high fever and incessant vomiting; there was an initial rigor and the patient looked very ill. Her symptoms in one word resembled those of malarial fever. A blood film was taken and she was immediately put on to quinine given in effervescent form which she retained. The spleen was quite palpable, about a finger and a half below the costal margin. No malarial parasite was found, her temperature was normal on the third day but the spleen did not disappear. The ordinary spleen mixture was prescribed, but the size of the spleen remained the same a fortnight later. About a month later she had another relapse of a similar kind but less severe, and on administration of quinine the temperature came down very quickly. This time the spleen was a size bigger than before and subsequent administration of quinine failed to bring about a reduction of the size. A fortnight later she had a third attack which came on exactly like the first and second ones with rigor, differing from them however in being resistant to quinine orally and later on given intramuscularly. The temperature assumed a remittant type, the spleen became quite hard within a week's time, being pal-

pable $3\frac{1}{2}$ finger breadths below the costal arch. After a week the patient looked more cheerful, the temperature came down and a craving for food returned. It must be noted that neither could malarial parasites be found nor was there any Widal reaction during the remittent period. During the second week the temperature began to show a daily double rise, at first low which soon became high, becoming low again after 10 days from the beginning of second week. The spleen all the while increased rapidly. The tongue was quite clean and no one would have suspected that the patient was getting fever by merely looking at her. During the fourth week the temperature was of a low intermittent character, pretibial oedema was just appearing, and the patient was emaciated. A leucocyte count was made—Total W B Cs = 3,700 and differential count—Polymorphs 51 per cent, large Mononuclears—21 per cent, small Mononuclears—24 per cent, Eosinophiles—4 per cent.

From the physical signs alone there was very little doubt about its being a case of kala-azar. The patient was put on to antimony and she recovered in 6 weeks.

The second and the third cases were of an exactly similar kind. There was pyrexia with rigors which reacted to quinine immediately, the spleen enlarged each time with the fever but did not disappear with the cessation of the fever. Each time the mouth temperature was taken, it was below normal during the apyrexial period. After two or three such attacks a remittent type of temperature was the rule, at times high, at times low, and not reacting to quinine in any way. The temperature then came down, often touching the normal, but rising and falling every evening. At this stage the typical signs and symptoms of kala-azar appeared. In one case spleen puncture was done and L. D. bodies were found. The spleen was enormously enlarged in each case.

CONCLUSIONS

(I) It is not at all safe to diagnose a case of fever to be malarial in origin merely from the history, the physical signs and reaction to quinine.

(II) When the spleen does not disappear after the temperature comes down to normal and remains so for some time in spite of the patient taking quinine in solution in proper doses the suspicion should at once arise that probably the fever is not malaria.

(III) The enlargement of the spleen is most noticeable during the pyrexial period when the consistency of the organ is more or less soft. During the afebrile time the spleen becomes hard.

(IV) If the temperature persists, especially a moderate evening rise after the remittent stage, and if the spleen remains enlarged to

the same extent as it was during the remittent period the case is probably one of kala-azar.

A CASE OF UNUSUAL MALPRESENTATION

By J. A. ROWLAND, L.M. & S.,
Snr Sub-Assst Surgeon, Bhussawal

SOME time ago I was asked to attend a woman (multipara) who had been in labour for more than 24 hours. Three sub-assistant surgeons were already in attendance and the general condition of the woman was unsatisfactory. The sub-assistant surgeons were of opinion that the case was one of twins.

Whilst admitting that the abdomen was abnormally large for a single foetus I refrained from positively stating that the woman had twins. As the labour pains were very strong a detailed abdominal examination was difficult. On making an examination per vaginam I found the head (vertex), hand and foot *firmly impacted* in the vagina, the head being between the hand and foot.

As the District Surgeon (Dr. Haworth) had come into the station I availed myself of his presence. The woman was anaesthetized and every effort made to effect delivery. It was found impossible to return any one of the presenting parts into the uterus. The possibility of interlocked twins was thought of, but no definite diagnosis could be arrived at. The head was perforated with great difficulty owing to the oedematous condition of the vagina, and an arm was removed at the shoulder-joint. Attempts were next made to bring down the leg, simultaneously pushing back the head into the uterus. This was not possible. The head was severed from the thorax by cutting through the neck with a pair of blunt-pointed scissors. It was then found possible to push the head into the uterus. This gave an opportunity of conducting an examination of the uterus. It was ascertained that there were no twins. A leg was pulled down and the body of the foetus extracted. The foetus was a full-term child of normal size. As is usual there was difficulty in extracting the after-coming head.

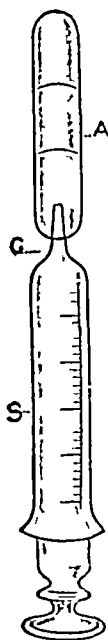
On completion of delivery it was found that the woman had a sessile submucous fibroid tumour, the size of a large orange, situated in the upper segment of the uterus. It was also noted that the tumour was incompletely split in halves. Previous to this confinement the patient had had two normal deliveries. The relatives of the patient would not agree to keep her in hospital. She expired about 24 hours later.

Remarks—The interest in this case is the unusual degree of malpresentation, a head, foot and hand presentation must be rare in a full-term child. Although a fibroid in the body of the uterus interferes with natural uterine action it is difficult to understand how a fibroid of the size found could cause a malpresentation of this kind. The diagnosis of intra-uterine fibroid under the circumstances would have been extremely difficult.

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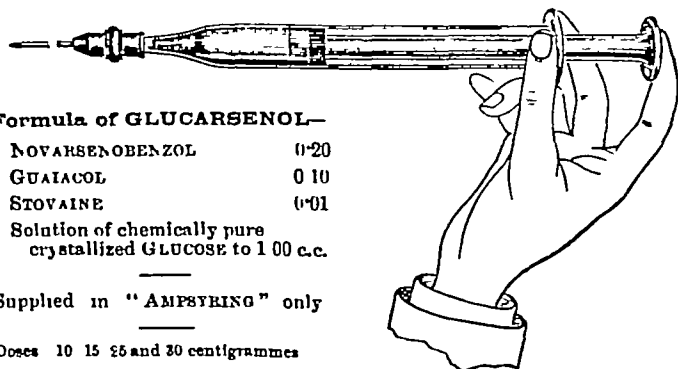
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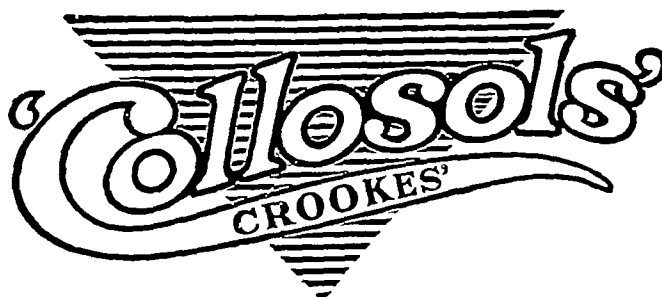
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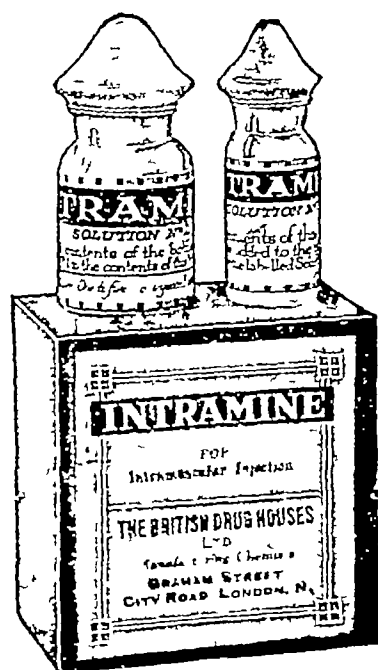
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Indian Medical Gazette.

JANUARY, 1923

THE ECONOMY AXE

There is much talk of the Economy Axe and there are grave misgivings in many breasts lest it should descend on the tree from which their sustenance is obtained

There is one tree of which the branches are public health, medical relief, medical education, and medical research, on which we hope the axe will not fall. This tree is not one which saps the strength of the community, it is one whose branches purify the air and under whose shade many a weary pilgrim finds shelter and comfort. It sadly needs more nourishment and whilst it might profit greatly by being trained and trimmed by the hand of a master-gardener, we earnestly hope that no brutal weapon such as an axe will ever be employed for the purpose.

It is by no means a perfect tree and the relation of its branches to each other might with great advantage be so regulated that each should be a source of strength to the whole tree and should in turn derive its strength from the main stem.

Some tender shoots made their appearance recently with every promise of filling up an ugly gap which had for years been an eyesore and a source of weakness to the tree. One of these has already been ruthlessly cut off just as we were rejoicing in its prospects of healthy and beneficent growth, another, more fortunate, has been allowed to make a healthy and vigorous growth and promises to add greatly to the appearance and usefulness of the parent tree.

The parable is not difficult to read, we of course refer to the growth of higher medical education and research in the East and West of India. The shoot whose untimely fate every one deplors is the Bombay School of Tropical Medicine, the one which has been spared is the Calcutta School. But it is the welfare of the whole tree of medical knowledge and medical progress in India which is the important matter for this country. The health and orderly growth of the tree as a whole is a problem which demands the most skilled

attention, and it must be tackled as a great whole and not from the point of view of any one separate branch.

There is urgent need of co-ordination and strengthening of the activities of the various medical services in India. Much valuable energy is going to waste owing to the fact that the question has not been considered from the broad imperial point of view. The devolution of other branches of Government may be a sound policy, but the task of dealing with the medical needs of India demands the collective and intelligently co-ordinated efforts of all the best available brains. If these are allowed to spend themselves in isolated and haphazard activities, there will continue to be an appalling waste of splendid material.

In spite of the magnificent work which has been done by individuals in India it must be admitted that medical administration and research in this country are not organised in such a way as to make the best use of the men who are employed. If we were to take even the limited amount of money which is being spent on the combined military and civil medical services at present, and place it at the disposal of a well-informed committee which would be liberated from the bonds of vested interests and established custom, we are satisfied that it would be possible to organise a medical and public health service which would be a credit to India. As things are, which of us would welcome the visit of a party of expert medical men from one of the other countries of the East? Would we not try to take them round India as rapidly as possible so that they might not spy out the pooriness of our medical organization?

The first thing to do is to realise our defects. Until we have done that there is little hope of any improvement.

In varying degrees all the branches of the medical and public health services in India admittedly stand in urgent need of reform, and the interests of true economy demand an efficient reorganisation for the purpose of ensuring that each unit in the military and civil medical services shall be employed in such a way as to render the maximum of useful service to the country.

A committee on the same lines as the Inchaape Committee aided by the best brains available in the medical world, is badly needed to deal with the whole problem of medical activity in India its terms of reference should be "to draw up a scheme for the more efficient and economical utilization of the meagre funds which are now being spent on the medical and public health services of India"

"OURSELVES"

The *Indian Medical Gazette* is now appearing in an enlarged form. Hitherto lack of space has necessitated the omission of much valuable material, and it has been the unenviable task of the editors to weed out many contributions which they would have liked to include. But apart from original articles it is the desire of the editors to keep their readers informed of recent advances in the diagnosis and treatment of the diseases which they have to treat, the march of medical science has become so rapid that it has not been possible to find space for half the abstracts which would be of value to our readers.

It is not so much the enlargement of the Gazette as the improvement of its quality that is being aimed at, and we hope that our readers will co-operate in raising still further the high standard of excellence which has been maintained in the past.

The chief aim of the Gazette will be to help the medical practitioners of India in their everyday work, not only by offering them contributions to medical knowledge in the form of original articles, but also by giving abstracts from the medical journals of the whole world. By these our readers will be kept informed of recent advances in our knowledge of the diseases which are common in India, especially of those which are of importance to the general practitioner.

Every effort will be made to retain and to emphasise the practical tone of the Gazette.

Any suggestions from our readers for the improvement of the Gazette will be gratefully received, the almost entire absence of such suggestions in the past may be taken as indications that our readers are satisfied with the Gazette but we are fully aware of great possibilities of improvement.

There must be many busy practitioners who have no time to send in long formal contributions, but who have gained valuable experience in such matters as treatment, diagnosis, hospital administration and the like, which they could contribute in a few lines. We are anxious to receive such "hints and tips" as could be included in a sheet of note paper and if the suggestion is approved of by our readers we would gladly make a feature of short articles on these lines. The Gazette is not published in the interests of any one class of the medical profession, it is meant to help every one, but especially the general practitioner who desires to maintain and add to his efficiency.

Some contributions cannot be published in full and we would be very glad if contributors would expressly state their willingness to allow us to modify or curtail their articles in case it is impossible to reproduce them in full. We have a duty not only to contributors but to the large body of our readers, limitations of space and the necessity of keeping a due proportion between the subjects dealt with impose on us an obligation to curtail their articles in some cases. At present twice as much MSS as can be published is being received.

Contributions which are of interest only to scientific workers are more suitable for such journals as the *Indian Journal of Medical Research*, but such articles as are of importance to the profession as a whole will always be welcomed, even though they deal with medical research. It is very gratifying to find that an ever increasing interest in the Gazette is taken by workers on tropical diseases in all parts of the world, abstracts of many articles from the Gazette appear in such journals as the *Bulletin of Tropical Diseases* and our contributors can feel assured that their additions to medical knowledge are addressed not merely to medical men in India but to the entire medical world.

Some valuable articles are received from Indian writers whose knowledge of English idiom is imperfect. We are sure that they will not object if we take the liberty of making any necessary modifications in the wording of their contributions. Clearly typed articles are preferred, but contributions clearly written on one side of the paper will be readily accepted.

Our readers belong to so many classes, not only of the "official" but of the "independent" practitioners that it is obvious that we cannot devote much space to the championing of the special interests of any one class of medical men in India, but in any matter which affects the welfare of the profession as a whole we will always be ready to help.

It must be noted that the editors do not accept any responsibility for statements made by firms which advertise in the Gazette, the advertising branch being entirely separate from the editorial branch. The publishers however are exceedingly anxious to avoid the insertion of any advertisements which are of an unethical nature and we will gladly bring to their notice criticisms of any advertisements which may be regarded as objectionable from this point of view. A glance at the advertisement pages will show that a high standard is maintained in this respect and we feel that the advertisements are of considerable value and interest to our readers though of course, they must exercise their own judgment as to the truth of the assertions made by advertisers.

THE INDIAN MEDICAL YEAR, 1922

A REVIEW

Eppur si muove said Galileo in 1663 as he rose from his knees after reciting the infamous oath of abjuration and if the qualified and legitimate medical profession in India find themselves to-day in much the same position as Galileo driven to desert the line of pure enquiry and of scientific research for an attitude of tame and ignorant orthodoxy, yet in the aggregate they can point to a useful record of work done and of endeavour accomplished. It may not be out of place in this, the first issue of a New Year to attempt to summarise the Indian Medical Year, 1922.

TROPICAL MEDICINE.

Malaria—The theory that the malarial parasites are extracellular throughout their life cycle that they are adherent to but not within the erythrocytes receives support from Major J. A. Sinton. The evidence put forward however is far from convincing. The same writer records a case of malaria due to *Plasmodium tenue* (Stephens, 1914) and comments on its likeness to *P. immaculatum* (Meyer and Rieder, 1908). The view that *P. tenue* is anything more than an actively amoeboid variety of *P. falciparum* (vel *Laverania malariae*) needs much fuller confirmation before it can be accepted. The same author describes a most ingenious and useful modified Wright's capsule for culture of the malarial parasites *in vitro*, and comments on the accidental presence of free living protozoa in old distilled water as a possible fallacy in the thick film method of examination. Capt. R. N. Raja draws attention to the ease and simplicity with which post-mortem examinations for cerebral malaria may be carried out by making and staining smears of the cerebral cortex.

Dr C. A. Bentley considers that to tinker with the problem of malaria in Bengal is useless. Northern

and Eastern Bengal which are periodically flooded every year are relatively malaria-free and are thickly populated and flourishing. In Central and Western Bengal—and especially where the new network of road and railway embankments has entirely altered the surface of the country—there is no systematic flooding and much malaria. Bengal being practically one huge delta, the conditions are analogous to those in Egypt and the remedy for Bengal malaria is systematic and properly controlled flooding of the areas concerned. Dr Bentley's frank expression of unorthodox views has brought him into controversy with engineers and others and the importance of the subject is emphasised by the officially suggested creation by the Bengal Government of a new and enlarged Antimalarial Department when funds permit. In Assam although malaria is rampant lack of funds prevents the appointment of any whole time staff for antimalarial operations. Major A. D. Stewart draws attention to the fact that silt-laden water absorbs solar radiant heat more rapidly than does clear water, and rises to a higher temperature. This heating factor may play an important part in the destruction of mosquito larvae in the flooded areas of Bengal. Lt-Col A. B. Fry comments on the close association of man and cattle in Bengal villages. If the cowsheds of a village were all removed to its periphery this would provide the local anophelines with a bait and might materially reduce the malarial incidence. The increased prevalence of malaria in Bombay has recently attracted attention.

With regard to treatment the important enquiry by Major H. W. Acton into the action of the different cinchona alkaloids has been continued throughout the year in association with Major R. N. Chopra and has been recently reviewed in our columns. The dextro-rotatory alkaloids of cinchona are more parasitocidal than are quinine and the levorotatory alkaloids. Concentration and accessibility to sites of parasite multiplication are important factors in the treatment of malaria by these alkaloids. They probably only attack the parasites during the short period when the latter are still extracellular once the parasite has penetrated into the erythrocyte it is within a quinine-free area and can multiply undisturbed. Hence cure is a process of fractional destruction of parasites. The oral route is the best for administration and in malignant tertian infections quinine and the other alkaloids are of approximately equal efficacy. In benign tertian and quartan infections however the absolute cure (without relapse) rate is 50 to 60 per cent with quinidine as against 15 to 25 per cent with quinine. In these therefore quinidine should be prescribed in solution in preference to quinine. For wholesale and village treatment cinchona febrifuge is the best line of treatment. It should be given two hours after a meal, in order to avoid vomiting. Intramuscular injection of the alkaloids has its uses where they cannot be retained orally but such injections are always attended with local necrosis and inflammation, even though sometimes of only a mild grade. Major C. H. Brodribb recommends 5 grains in 10 c.c. for intramuscular injection, as causing very little after thickening. Figdoo and Pincock (*B. M. J.*, 1st July, 1922) record a remarkable case of massive necrosis of muscle with encapsulation of the necrosed mass after intramuscular quinine. For cerebral and comatose malaria intravenous quinine is the sheet anchor of treatment and, although liable to produce a transient fall of blood pressure if given too rapidly, should be far more often resorted to. The publication of the report by the special Committee on Cinchona Bark of the Imperial Institute to the Secretary of State is an item of great interest. In 1916 India's exports of cinchona bark averaged

1 Owing to the exigencies of publication this review covers the period Oct 1921—Nov 1922, rather than the exact calendar year.

2 Unless otherwise mentioned the commissioned medical officers referred to are all I.M.S.

600,000 lbs per annum In 1920 the amount exported was 198,000 lbs India produces factory bark but exports very little, since the two government factories use practically all the available supply The Committee think that special efforts should be made to considerably increase the production of cinchona in India, both for India's own needs and for those of the Empire The Government factories in India appear to be financially successful and the manufacturing side seems to present no difficulty

Kala-azar—The close of the year 1922 finds us as far away from the solution of the problem of the transmission of kala-azar as did its predecessor, the subject has not however been neglected during the year Mrs Adie's work on the bed bug, reported in 1921, in which she noted an intracellular phase of *L. donovani* in the stomach of a bed bug (*Cimex lectularius*) which had died after being fed on spleen juice from a kala-azar patient, gave new life to the very much worn bed bug theory of the transmission of the disease Lt-Col J W Cornwall and Dr H M LaFrenais reported some further experiments with bugs fed on kala-azar spleen juice and on flagellate cultures They failed completely to find any intracellular stage, although their experiments were carried out on an extensive scale and were checked by section cutting, and they demonstrated that "thick-tails" do not always occur but that they are probably a reaction to unfavourable environment, or possibly to the more favourable environment of damaged mucous membrane These workers consider that the bed bug is not the transmitting agent and that we should turn our attention to other possible means of transmission Lt-Col W S Patton on the other hand considers that Mrs Adie's findings confirm the bed bug theory but he thinks that the disease is transmitted through the bug being crushed on the skin and rubbed into an abrasion He contributed some very interesting experiments showing the viability of the parasite in the gut of the bug (up to 44 days), and some useful negative evidence by feeding experiments (including two human experiments) with infected bed bugs

Mrs Adie's recent findings—*Leishmania*-like forms in the salivary glands of a bed bug caught on the bed of a case of suspected kala-azar—lose a considerable amount of interest in view of the fact that most authorities consider that these organisms were *Nosema* Lt-Col F P Mackie has also described some *Leishmania*-like organisms with single nuclei which he found in the salivary glands of bed bugs from a kala-azar patient's bed

Dr B M Das Gupta, working with cultures taken from an artificially infected monkey, found cyst-like forms in a 15-day old dried up culture tube which were very much like Mrs Adie's intracellular forms Lt-Col R Row contributed a paper on the reversion of flagellates to round forms in old cultures His claim that these forms are truly post-flagellates can hardly at present be said to be substantiated

A survey of the biting insects of Assam carried out by Dr Awati showed amongst other facts that the distribution of *Conorhinus* corresponds more closely than that of any other insect with the distribution of kala-azar

Dr L E Napier made an analysis of the clinical picture in 300 Calcutta cases in which he had found *Leishman Donovan* bodies by spleen puncture He compared this with a similar analysis of 160 cases which simulated kala-azar but in which no *Leishmania* parasites were found by spleen puncture, i.e., non-kala-azar The clinical differences between these two sets of cases are as he points out, very small

The question of diagnosis was discussed very thoroughly at the Indian Science Congress and a number of papers were read on the culture of the parasite from the peripheral blood Dr B M Das Gupta demonstrated that this was the surest method of diagnosis as he had obtained a culture in 100 per cent of untreated cases Lt-Col F F Elwes claimed that liver

puncture was a more reliable method, although admitting some failures with this method

Dr L E Napier introducing the "aldehyde test" showed that in 98 per cent. of the first 150 cases the result of the test corresponded with the spleen puncture findings His subsequent experience has shown that, although a positive result is always reliable evidence of kala-azar, early cases of kala-azar are liable to give a negative result.

No real advances have been made in the treatment of the disease, but Dr Napier's series of cases is important in that it shows that intramuscular injection with a pure form of "scale" sodium antimony tartrate can be given without causing unbearable pain, without permanently damaging the tissues and with therapeutic success The method was most successful in the case of children

Dr Monier Vinaid reports a case from Morocco successfully treated with stibacetin (Stibenyl), but Napier reports 10 cases treated with this preparation in which the results were extremely unsatisfactory

Dr U N Brahmachari has contributed an interesting paper on antimony compounds His work on the histopathology of antimony poisoning is interesting and important He claims that ammonium antimony tartrate is the least toxic of the antimony tartrates and explains that it is the nitrogen molecule that reduces the toxicity He prefers however urea stibamine for the treatment of kala-azar and gives details of a few cases successfully treated

Dr Brahmachari's and Dr S Bhattachary's two cases of dermal leishmanoid are most interesting, not so much from the clinical point of view, as the condition is obviously rare, but from the point of view of the etiology and treatment of kala-azar The skin lesions produced in these two patients by *L. donovani* showed no tendency to skin atrophy and ulceration, and were of an entirely different type from the skin lesions caused by *L. tropica*

Dysentery—Lt-Col F P Mackie reviews the dysenteries of Mesopotamia Of 6,550 stools examined from British and Indian troops and followers 19 per cent showed *E. histolytica* or its cysts Healthy carriers numbered 6 per cent of British and 10 per cent of Indian troops Of 1,121 dysenteric stools 20 per cent yielded Shiga bacilli and 16 per cent Flexner or allied strains Examination of the blood before death and of both blood and bile on post-mortem failed to give cultures of dysentery bacilli

Major R N Chopra reviews the therapeutics of emetine With the wonderful war work of Dobell, Wenyon and O'Connor the muddle concerning the entameba has now been cleared up Emetine, although devoid of any direct action upon *E. histolytica*, is an efficient remedy in amoebic dysentery In India however febrile dysentery is usually bacillary and thousands of patients throughout the country suffering from bacillary dysentery are subjected to prolonged useless and even dangerous courses of emetine administration Even some cases of amoebic dysentery fail to yield to emetine treatment Such persons are often found to pass small strains of *E. histolytica* cysts To some extent however, relapsing amoebic dysentery is often an instance of re-infection in the same surroundings from the same carriers

Emetine being a drug with a cumulative and markedly depressant action on the heart and other organs its administration should be most carefully controlled A course of 12 grains is about the maximal safe dose The patient should be put to bed whilst on emetine treatment, and the pulse watched Probably the best line of administration is a six-day intensive course of emetine, the patient receiving on each day one grain hypodermically in the morning and at night three grains of bismuth emetine iodide orally, preceded by one-sixth of a grain of omnopon If after six days the dysentery still persists it is not likely to be amoebic. If the patient still remains infected with *E. histolytica* emetine treatment should be suspended The stool should be examined once a

week and, if necessary, the emetine course repeated once a month

With regard to bacillary dysentery the recent work of Majors Acton and Chopra shew that the shock and prostration associated with the disease are phenomena due to intoxication by pressor bases. Bacilli of the Flexner type produce but little toxin. The Shiga bacillus when grown on ordinary broth produces but little toxin but when grown on a fluid medium rich in amino-acids resulting from proteid disintegration, it produces considerable yields of toxins which are probably of the nature of amines. Whether a Shiga infection be only a mild diarrhoea or a fatal and fulminating dysentery may largely depend upon the presence or absence in the intestinal contents of a suitable substrate upon which the bacilli act. The results obtained by these workers are of very considerable interest and throw much new light upon the etiology and pathology of bacillary dysentery. The immediate moral is the necessity of withholding proteins from the diet of a case of bacillary dysentery. Apart from this promising line of investigation there has been little progress during the year in India in the treatment of bacillary dysentery. The sheet anchor of treatment remains the intramuscular or intravenous administration of polyvalent antidisenteric serum in large doses, 60 to 80 c.c. and it still remains an extraordinary feature of the situation in India that the supplies of antidisenteric sera which are so universally required throughout the country are still all imported from Europe and America and that no antidisenteric serum is manufactured in India.

Cholera—Several interesting papers dealing with cholera have appeared during the year. Lt-Col C A Sprawson records the prevalence of a cholericoid type of epidemic in the U P and especially in Lucknow in July—September, 1921. An organism resembling *paratyphosus B* but quite unlike the cholera vibrio, was isolated from several cases. Major W C Ross records the history of the 1921 outbreak in Bihar and Orissa. This outbreak reached its maximum in July and was extremely prevalent at Patna. Cholera carriers the mango season and a maximal prevalence of flies appear to have been the principal factors concerned. Major A J H Russell reviews the cholera incidence in Madras for the years 1900—1920 and shews that there is a close correlation between cholera epidemics and rainfall. In the Southern districts the maximal incidence of cholera is in December-January one to two months after the N E monsoon in the Northern districts in July-August after the S W monsoon. The figures given are very suggestive and further enquiry along these lines may yield information of much value.

Lt-Col F P Mackie analyses cholera records from Mesopotamia. In 1916 an outbreak at Amara was traced to an Arab milk supply. The cases in 1917 were traced to fruit. Experimentally it was found that living cholera vibrios could be recovered from the interior of melons injected seven days previously, and from tomatoes and cucumbers injected three days previously. Stress is laid upon the necessity for avoiding any damaged or bruised fruit during the prevalence of cholera.

With regard to treatment Dr L M Chatterjee advocates preliminary intravenous infusion of sodium bicarbonate solution, 120 grains to the pint, followed by Rogers' hypertonic saline. He also comments on the value of fractional one-eighth grain doses of calomel every half hour. The mortality at the Mayo Hospital under this line of treatment was 20 per cent, as against varying figures mostly of a larger order at the Medical College Hospital.

Major H G Styles Webb considers that the dose of prophylactic official cholera vaccine (1 c.c.—8 000 million) is too low and advocates a single dose of 1½ c.c. or a dose of 1 c.c. followed after a 10-day interval by 2 c.c. Opinions as to the value or otherwise of prophylactic inoculation against cholera are

still divided. On the other hand in Java single doses of 1,500 million are usually given.

The most remarkable work of the year on cholera, however, is the isolation by Majors Acton and Chopra and their co-workers of the 'cholera amine' in its pure state and its experimental testing. The indol reaction for the cholera vibrio is an indication of its amine-producing powers, and depends on the production of amine from the amino-acid tryptophane. When grown for 10 days on veal-peptone broth the cholera vibrio yields a group of pressor bases which were isolated, obtained in a state of purity and experimentally tested. It was found that despite the relative insusceptibility of animals to cholera administration of 100 mgms to a young rabbit produced the symptoms of cholera with characteristic collapse. The kidneys shewed cloudy swelling and intertubular oedema and the mesentery intense congestion. These findings explain the pathology of cholera and a continuance of the investigation will probably lead to greatly improved methods of treatment in acute and fulminating cases.

Plague—Elsewhere in our columns in this issue will be found an abstract of great interest from the Annual Report of the Public Health Commissioner, India for 1921 which reviews the subject of plague in India during the past 20 years, whilst under

'Current Topics' will be found an account of the extremely interesting work carried out by Dr Strickland under the Indian Research Fund Association on the value of rat destruction during the off season in villages infected late in the epidemic. Many years' experience has clearly demonstrated the uselessness of any attempt at wholesale rat destruction during the prevalence of a plague epidemic but as suggested by Lt-Col J C G Kunhardt a vigorous campaign of rat destruction in 'carry over' villages during the off season may be attended with great success and may prevent the next year's outbreak. Major F W Craggs exceedingly important work on the three species of *Xenopsylla* viz *cheopis*—which is the plague flea, *asia* and *brasilensis* sheds a new and interesting light on the reasons for the prevalence of epidemic plague in certain areas of India and its complete absence in others. The practical bearing of Major Craggs' work is that it should now be possible, by mapping out the 'cheopis belts' in India to estimate what areas are or are not liable to visitation by epidemic plague to concentrate antiplague measures on these areas, and to neglect the cheopis-free areas which are not liable to infection.

Filaria is a subject which has received considerable attention in 1922 its importance being emphasised by the appointment at the Calcutta School of Tropical Medicine of a special research worker on filariasis. Dr Sundar Rao. Dr P N Das of Puri found 11 per cent of 1700 persons infected of 2,490 mosquitoes collected in the area no less than 90 per cent of those found in human habitations were *Culex fatigans* and of these no less than 10 per cent shewed filarial infection. Forty-four per cent of a batch of mosquitoes collected in Puri municipality were infected and 31 per cent of 118 men examined there. He records the successful finding of microfilaria in the day blood by taking the blood from a vein, diluting it 15 times with distilled water, centrifuging and examining the deposit. Dr S K. Roy and Dr S C Bose, also working at Puri find 27 per cent of the general population infected and 28 per cent exhibit clinical manifestations of the disease. The elephantiasis rate was 11 per cent, and lymphangitis 13 per cent. They consider that the microfilaria found bear a resemblance to those of *F. philippinensis* rather than to those of *F. bancrofti*, and trace the developmental stages in the mosquito. By way of treatment many drugs were tried, sodium thiomol, sodium margosate, iodine, sodium antimony thioglycollate—which gave good results in five cases and sodium antimony tartrate. The last named drug administered intravenously, appears to give better results than any other in filariasis but it cannot at

present be said that we are in possession of any efficient remedy

Lt-Col J W Cornwall and Dr H M LaFrenais draw attention to the frequency of fugitive swellings in filariasis, swellings presumably due to the migration of adult filariæ through peripheral lymph channels and ask for such cases to be reported. An important paper by Lt-Col F P Connor (*Brit J of Surgery*, Vol X, No 38), deals with the surgical aspects of filarial disease. It is illustrated by beautiful radiographs of calcified guinea-worms in cases with such mistaken diagnoses as sciatica synovitis of the knee, periostitis of the tibia and chronic rheumatism. The writer discusses several interesting and some unsolved problems in connection with filarial disease. The Puri workers report having occasionally seen microfilariae of gigantic size and the possible connection of such aberrant embryos with elephantiasis is a point possibly worthy of attention. The recording by Herff (*Surgery, Obstetrics and Gynaecology*, June 1922), of several cases of elephantiasis successfully treated by the Kondoleon operation emphasises the value of this technique, which should be practised in India far more often than is at present the case.

Relapsing Fever is also a subject which has received special attention during 1922. Lt-Col C A Gill describes the history of the 1918-1920 outbreaks in the Punjab. The suddenly increased mortality in May and June was due to this disease. He states that relapsing fever is widely endemic in the Punjab and that it assumes epidemic conditions at more or less regular intervals. The disease is often confused with influenza and pneumonia and often missed. The most important contribution of the year however, is the paper by Major F W Cragg read before the Royal Society of Tropical Medicine and Hygiene and summarising much valuable original work. The author establishes the louse as the vector in India and discusses the 1917 and previous epidemics in the U P the western portion of which is especially affected. May and June are the months of maximum incidence, 50 per cent of the mortality is in patients between the ages of 20 and 50 years, adults are attacked far more than children, and more males die than females—a point in which the disease presents a marked contrast to plague. Chamars and Koris shew the heaviest caste incidence. The disease was experimentally transmitted by lice to monkeys, and the author contributes a valuable study of the bionomics of *Pediculus* in hot climates as compared with its bionomics under European conditions. Laboratory workers will appreciate Major Cragg's very ingenious pediculus wristlet, made from an ivory ocular micrometer case, and as neat as a lady's wrist-watch. Under normal conditions a spontaneous delousing of the population sets in when the weather becomes hot and dry in April-May but in 1917 and other epidemic years there was an abnormally low temperature and an increased humidity during these months factors which prevented the annual delousing, and led to the epidemics by prolonging the life of the pediculi concerned. The high incidence of the disease in young adult males is explained by the habit of crushing infected lice between the finger and thumb nail, the spirochaetes entering the soft tissues of the nail bed. This paper constitutes one of the most important contributions to the literature of the disease. The author finally discusses such inexpensive measures for delousing as are readily available and notes that clothing may be disinfested by exposure to the full heat of the sun at a temperature of 130 degree F on a sand bed.

Dietetic Diseases—An important paper on the etiology of rickets in India is that by Major H S Hutchison. In Europe rickets is a disease of the poor and of the slums in India exactly the reverse holds, the open-air living but very poor coolie class are free from the disease, which is most prevalent among well-to-do Hindus and Mohammedans. The purdah system and defective and dark housing conditions are to blame. Since breast-feeding is universal, the question of arti-

ficial foods is here not concerned. Something over and above mere deficiency in vitamin A is needed to explain the Indian conditions. Incidentally Major Hutchison's article is a powerful argument for better town-planning in India.

Sir Patrick Hehir gives a summary of the disease-states seen in association with starvation during the siege of Kut. Lt Colonel C A Sprawson found that 50 per cent of beri-beri cases in a Chinese labour corps shewed myocardial debility and irregularity. Dr A B de Castro records an outbreak of epidemic dropsy with gastro-intestinal symptoms in the N Andamans in a coolie camp. The mortality was 16 per cent and the most distressing symptom was dyspnoea. An outstanding feature of the year is Major Acton's confirmation of the theory that diseased rice is the cause of the epidemic dropsy of Bengal. Storage of special grades of rice leads to their becoming infected with a spore-bearing aerobic organism which converts the more soluble proteids and proteoses of the rice into various decomposition products. These products have now been isolated and experimentally tested in the pure state, although much of this work still remains to be published. They cause a marked depression of the perfused rabbit heart, whilst monkeys fed upon the infected rice developed diarrhoea and oedema of the limbs. The peculiar caste and household incidence of the disease is explained by the one-sided rice diet of middle class Hindus and its association with years of high prices of food stuffs by storage by grain merchants in order to obtain a higher price.

Major Acton has also discovered the cause of the mysterious disease, lathyrism, which cripples so many persons in the C P and U P, and especially in the northern part of Rewah State. The disease is a type of spastic paraplegia, of usually sudden onset, and leads to permanent crippling. The chief predisposing cause is the harwar system of bondage. The land labourers receive, not so much payment in cash, as payment in kind and—during famine years—their employers are driven to feed them upon an almost exclusive vetch diet, chiefly of imported Bhagalpur kesari dal. Under monsoon conditions of high temperature and humidity this vetch germinates and, in so doing, produces a soluble and poisonous toxin. The results of such a diet are a lesion of the spinal cord below the 2nd lumbar root, probably due to spasm of the blood vessels of the antero and antero-lateral tracts. The toxin has been isolated in a state of purity and experimentally tested by Majors Acton and Chopra and their co-workers. The toxic principle resides in the volatile and water-soluble fraction. It causes a rise in blood pressure, spasticity of the hind limbs when injected into monkeys, and a temporary paralysis of the hind limbs in guinea-pigs. Animals however appear to be less susceptible than man.

Another interesting dietetic disease is acute "kodon" poisoning, due to the ingestion of a cheap grain by the poorer classes of the U P, and described by Dr A Swarup. The poison chiefly affects the nervous and cardio-vascular systems and causes vomiting, unconsciousness, tremors, and a rapid and feeble pulse. The condition rarely, if ever, proves fatal. The poisonous principles of "kodon" (a species of millet) are at present under investigation at the Calcutta School.

It will be seen that diseases due to diet are of considerable importance in the practice of medicine in India and far more attention should be paid to Indian diets and to such diseases in the medical curriculum than has hitherto been the case.

Leprosy—Special attention is now being paid by both the Imperial and Provincial Governments in India to the leper problem. Madras, we understand, is spending several lakhs upon the creation of a new leper colony settlement. A new colony was opened in Bihar and Orissa during the year. In Bengal the scheme for a large leper colony has been held up by the prevalent lack of funds but an allotment has been made from the King Edward Memorial Fund

tor the creation of a new special leprosy research institute—perhaps a wiser policy. In diagnosis Dr D A Turkhud and Dr C R Avari found Gate Papacostas formol-gel reaction positive in all of 116 lepers examined. The year has been marked by the publication of a most important paper by Sir Leonard Rogers reviewing the whole history, etiology, probable modes of infection, prognosis and treatment of the disease. It seems almost certain that leprosy is ordinarily acquired by direct inoculation of the infective bacilli either into a surface abrasion on the nasal or other mucosa, or by inoculation into the skin by an infected pin or needle. The author comments on the frequency with which anesthetic leprosy appears first in the lower limbs in bare-footed races. The segregation from lepers of all young persons under 20–30 years of age is essential. With modern and improved treatment by the ethyl esters the advanced and hopeless cases will die out, the non-infective old standing anesthetic cases will constitute no danger to the community whilst recent and tubercular and mixed and infective cases will come to new and modern hospitals and colonies which will come to be regarded rather as hospitals for cure than as homes for incurables, thus rendering it possible in the future to extirpate leprosy even from tropical countries.

In the Current Topics columns of this issue we publish a special note on the progress made in the study of leprosy in 1922 by Dr E Muir in which—*inter alia*—is detailed the infiltration method of using the ethyl esters. The discovery that the ethyl esters of *Hydnocarpus wightiana* oil of India are as effective as those of *Chaunmoogra* oil renders available at once a cheaper and Indian source of supply of the requisite drugs for the most modern treatment.

Jaundice—In India is a symptom which may be of either slight or grave significance. Dr M I Parmanand considers that Weil's disease (epidemic icterohæmorrhagic jaundice) undoubtedly exists in India and gives details of 10 cases seen in Bombay. A spirochæte apparently true *L. icterohæmorrhagicæ*, was recovered from the urine of three cases. Dr A B de Castro draws attention to the prevalence of jaundice in the Andamans—a jaundice of apparently infective type and presenting analogies to Weil's disease. Lt-Col W Glen Liston draws attention to Bombay epidemics in 1906 and 1907 and 1913 to the prevalence of an apparently infective type of jaundice in several medical records from the Andamans and considers that both Weil's disease and possibly or probably true yellow fever exist in India. The subject of spirochætal jaundice in India is one which demands further and careful investigation.

Influenza has been a far less prevalent disease in India in 1922 than in 1918–20. Capt R H Malone reports the results of careful and detailed investigation of the bacteriology of the recent Indian pandemic. Pfeiffer's bacillus was found in the sputa of 75 per cent. of cases. Seventy-seven per cent. of influenza patients gave sera which gave a positive agglutination with this organism. The rôle of the pneumococcus is important. 96 per cent. of cases show this organism and it is at least predominant in severe cases. Hæmolytic streptococci were found to be conspicuously absent in the Indian epidemic, although non-hæmolytic streptococci are as usual, present in the sputum in both health and disease. The sera of healthy control persons showed no agglutination to Pfeiffer's bacillus and the sinuses as a reservoir of chronic, persistent infection should not be neglected. The recent work of Lt-Col M H Gordon, R.A.M.C., and others however, seems to show that there are two organisms really prevalent during pandemic influenza—one Pfeiffer's bacillus associated with chronic catarrh and afebrile states and the other a filter-passing micro-organism the true causal agent of pandemic influenza. Both are frequently present together. Dr S L Sarkar gives a very careful and guarded analysis of the results after prophylactic inoculation with the official mixed catarrhal vaccine and points

out that the wholesale use of the vaccine towards the end of an epidemic will be attended with a lower case incidence and mortality, no matter whether the vaccine be of value or not.

Schistosomiasis is a disease which has aroused some attention in India during the year. The publication of the monumental zoological monograph on Indian cercarie by Major R B Seymour Sewell marks a tremendous step forward in the study of this difficult subject—a subject in which cercarie resulting from the trematodes of birds, reptiles, mammals, batrachians and fish may be mistaken for those of human origin. Fifty-seven cercarie of the fresh water snail fauna of India are described and the monograph is profusely and beautifully illustrated and represents the labour of years. As to the great value of such a contribution to medical zoology there can be no doubt. Dr F Hilton desires to utilise measurements of the furcocercous cercarie as a basis for their systematic classification and claims that if this be done his "Group I," in which the ram of the tail are markedly shorter than the stem contains all the forms at present known to parasitise man. Capt S Smith, R.A.M.C. records the case of a British soldier apparently undoubtedly infected with *S. hamatobium* from bathing in a tank at Bolaram and comments on the possibility of the introduction of schistosomiasis into India by the return to Hyderabad Deccan of some 100 convalescents from abroad from the war areas all infected with this disease. The case recorded by Dr A H Harkness is more obscure and there is here less certainty that the patient contracted the infection in India.

Typhus is a disease which almost certainly exists in India. Major H C Keates draws attention to the existence of a typhus-like disease in Murree. Major F W Cragg dwells upon the typhus-like disease prevalent among Europeans in Bhim Tal and Sat Tal, and controverts Lt-Col J W D Megaw's view that it is possibly transmitted by ticks. He considers that this disease is true typhus that it is transmitted by pediculi and that its special incidence in women and children is explained by the fact that they usually travel up hill in dandies carried by coolies who place their lice-infested clothing in the dandies, whereas males usually ride up-hill and thus escape infection. Typhus is a disease for which the medical practitioner in India should always be on the look-out, and whose possible presence and distribution in India is worth attention.

Tuberculosis—Tuberculosis is now known to be one of the most terrible problems in Indian medicine. A remarkable address by Dr Gopal Chandra Chatterji on this subject is one which should receive the attention of all practitioners in the country. The causes for the prevalence of tuberculosis in Indian cities are only too obvious, poverty, ignorance, neglect, social customs and prejudices, early child bearing (in connection with which the special incidence of phthisis in Indian women after childbirth deserves special attention)—and insanitary conditions combined with overcrowding. The most valuable prophylactic measure is proper town-planning. The work of the King George V Anti-Tuberculosis League in Bombay is worthy of all praise and imitation, and sets a splendid example to the whole country. In Bengal a tuberculosis sanitarium is a most urgently needed institution. The tuberculosis problem in India is one which would well repay special investigation since in this country infection with bovine strains can be almost entirely excluded, and the problem thus becomes much more limited and capable of study. Lt-Col W Glen Liston and Dr M B Soparkar record the history of an outbreak of bovine tuberculosis in the Bombay Zoological Gardens—the infection having been apparently imported with animals from Germany. Lt-Col R. Row has investigated the lipid mechanism in cultures of the tubercle bacillus. In cultures both proteolytic and lipolytic enzymes may be demonstrated. The latter ultimately break down the tubercle bacilli, which now become non-acid-fast, the liberated fatty

acids from the bacilli can be extracted and saponified and an antigen thus prepared, which is at present under experimental test Dr M J Parmanand records the history of a case of pulmonary bronchomoniliasis simulating phthisis, and gives in detail the cultural findings and biochemical characters of the fungus isolated, which is apparently identical with *Monilia pinoyi* Castellani.

Ulcus Tropicum is the subject of a few papers published during the year. It is now clear that many local diseases with local names,—such as Naga sore, syces' ulcer of the U P, etc,—are one and all *Ulcus tropicum*. In fact Vincent's infection, *i.e.*, infection with the symbiotic Vincent's spirochæte and the fusiform bacillus,—is now known not to be limited to the throat. It may affect other mucous membranes, such as that of the penis, and is a not unknown sequel to amœbic dysentery in the colon. It may affect the subcutaneous tissues—*Ulcus tropicum*. It may even, if the report of a recent case in America be admitted, cause a fatal septicæmia as a secondary infection. The spirochæte is less persistent than are the fusiform bacilli, which are present in enormous numbers after the spirochætes have disappeared. Dr S N Mathur draws attention to the occurrence of cases at Unao during the rains,—where infection seems to be associated, as always with this disease, with a primary accidental lesion from spear grass, abrasion or other breach of the epithelium. Capt K C Sen describes the clinical symptoms and laboratory findings found in *Ulcus tropicum* as seen in the Expeditionary Force in N Palestine. His method of treatment by first thoroughly cleansing the ulcer with saline, then rapidly touching the whole of the ulcerated surface with Tabloid Hydrarg Perchloride, and immediately washing with warm saline seems very promising but is painful and is perhaps not applicable to large ulcers. A paper by Sir F S Lister and Dr H Q F Thompson on Tropical Ulcer in the Witwatersrand shews that in the mining labour force of the S African mines conditions with regard to this disease are very similar to those on the tea gardens and in the mines of Assam. The chief importance of this disease is the tremendous loss of working time which it involves in labour forces when it appears in epidemic form—in India, usually, during the monsoon months.

Of other diseases, with regard to *Syphilis* mention may be made of Dr S Ramakrishnan's finding that the formol-gel test of Gate and Papacostas gives only a 73 per cent correlation with the Wassermann findings whilst Lt-Col A W Overbeck-Wright contributes a valuable summary of the relationship of syphilis to mental and nervous diseases in India, and comments on the undoubted existence, if not prevalence, of G P I in Indians. In *Rabies* the publication of the first part of the very important memoir by Lt-Col W F Harvey and Major H W Acton on the degree of efficacy of anti-rabic treatment has not received half the attention which it deserves. The authors are very restrained in their conclusions, but the trend of their evidence is unmistakable. Statistics at the Indian Pasteur institutes probably constitute the most accurately collected mass of evidence in the world, the degree of risk in untreated "dog-bite" is undoubtedly very much over-rated, the degree of efficacy of present-day methods of anti-rabic immunisation is certainly over-rated. The publication of the second part of this memoir will be eagerly awaited by all interested in the subject in India. Meantime the question of the possible issue of anti-rabic vaccines throughout India continues to attract attention and the real solution of how to efficiently immunise a person against hydrophobia will only be found when the true parasitic micro-organism of rabies has been discovered and studied.

Rat-Bite Fever is now known to be not uncommon in India. In 1920-21 three cases occurred at the Calcutta Medical College Hospital. Dr B M Das Gupta contributes a careful study of a case which occurred at Shillong. There were two relapses of the

characteristic fever,—the incubation period being nine days from the date of the bite. Half a c.c. of blood was withdrawn from the vein and inoculated into two white mice on the 20th day after the bite. On the 18th day after inoculation the mice shewed typical *S. morsusmuris* in the viscera, the spirochæte being only three to four mu in length, with two to three short, steep turns. This experimental strain was brought to the Calcutta School and was kept going by sub-inoculation for several months. Yaws continues to be a subject of perennial interest, especially in Burma and Malaya. Its true relationship or otherwise to syphilis cannot even yet be said to be fully established though most authorities are perhaps agreed that yaws is not syphilis. Dr A Viswalingam contributes a study of yaws in Malaya. In Kuala Kangsar and Upper Perak at least 25 per cent of the population are infected at some time or another of their lives. A vigorous educational campaign and free treatment with N A B brought crowds of patients. Over 3,000 injections were given, the intramuscular route being employed in only four instances. The results are extremely good, and patients are not merely willing but anxious for treatment. The author rightly emphasises the educational value of such a campaign and calls for further educational and curative measures. Given the men and the money for such measures yaws could be easily obliterated in Malaya. "Parsimony in preventive medicine is a poor form of imperial economy."

TROPICAL SURGERY

Here there is a plethora of subjects with which to deal. Our columns continue to shew how immense is the field of opportunity and usefulness before the general surgeon in India. Here there are a hundred and one papers incapable of co-ordinated review. Lt-Col F P Connor's paper on *malignant disease* of the retained or imperfectly descended testis is of great interest. Three cases are recorded and a similar case under the care of Dr K K Chatterji. Malignant disease of the imperfectly descended testis appears to be of terrible malignancy and to be rapidly fatal. It is probably of the nature of an endothelioma, whereas malignant disease of the fully descended testis is rather carcinomatous in type and of but slow malignancy. The same author refers to the difference in the distribution of malignant disease in India as compared with that in Europe. In India carcinoma of the bowel appears to be rare, that of the stomach rare also, and that of the rectum much rarer than in Europe. On the other hand carcinoma of the skin and mouth is relatively common. These differences appear worthy of further investigation. Major H W Acton's publication of his important memoir on melanotic growths summarises the results of years of painstaking original research, and should be studied by all operative surgeons. The author shews the relationships of the melanoblastic layer of vertebrates to the structure and origin of these growths, discusses fully the etiology of both benign and malignant types, and concludes with a full and detailed bibliography.

With regard to *Amœbic Liver Abscess*, Dr K K Chatterji summarises the results of treatment in 255 tabulated cases, as also in six cases of amœbic abscess of the spleen—a condition to which attention was first drawn by himself and by Sir L Rogers. He advocates evacuation drainage by Klapp suction apparatus, and emetine. Capt A Sargood Fry records two cases of liver abscess which ruptured into the abdominal cavity, both proving fatal, and Lt-Col E C C Maunsell a similar case which recovered after operation.

With regard to *Hernia* Dr J W Wanless' valuable review of the exceptional hernias met with in India and the best surgical methods of dealing with them should prove most useful to operative surgeons in India, especially as he discusses factors peculiar to this country. Colonel Connor comments on the apparent rarity of femoral hernia in Indians. Is it due to the squatting posture or to some anatomical peculiarity? Major F W Porter, R.A.M.C. (ret'd), discusses large

scrotal hernia of the large intestine Dr R E Hoffmann advocates the treatment of *Hydrocele* by injection into the sac of from 2 to 8 c.c of 1 in 3 solution of phenol in absolute alcohol, and reports good results. With regard to the *Appendix* Major W L Harnett comments on a case where *Oxyuris vermicularis* was found in the lumen of this viscus and may have had an important bearing in its etiology, and Dr R J L Sladen advocates suction-drainage of appendicular and other abscesses the object in view being to prevent secondary infections and to hasten recovery the results are very good. Dr T N Varma records congenital absence of the *Spleen* in a girl of 13 the pancreas and mesenteric glands being abnormally enlarged and Dr R S Grewal, a similar case in a man of 72, where no compensatory enlargement of other viscera was found. The spleen appears to be an organ not essential to life. Major W L Harnett records a most interesting case of false aneurism of the spleen, the condition apparently having been caused by trauma to the abdomen, and the pathological findings being a sac almost as large as the spleen itself, containing blood and laminated blood clot, surrounded by a capsule of fibrous connective tissue. The author discusses the pathology of aneurism of the spleen and the cases recorded in the literature. In dogs this condition is sometimes associated with strongyloid worm infections, but not apparently in man. The same author comments on the value of tube grafts in *Plastic Surgery* of the face and limbs. In India, where facial mutilations and burns, etc., are of such common occurrence, he considers that there is a wide field for the use of this excellent method of transplanting large areas of skin.

Of many other individual papers of general surgical interest mention may be made of Capt. A S Fry's notes on tuberculosis of the bones and joints as met with in Indian practice, Dr A B de Castro's note on the use of intravenous iodine in pyæmia, the fatal case of gumma of the 8th dorsal vertebra unsuccessfully treated with both kharsivan and kharsivanised serum recorded by Major G T Burke and Capt. N C Mitra, the case of non-fatal fracture-dislocation of the atlas and axis vertebra recorded by Major E. W C Bradfield, and Major A K. Laudie's puzzling case of enormous swelling and oedema of the neck following thyroidectomy. Lt-Col G T Birdwood contributes an article on enucleation of the tonsils and adenoids, written from the point of view of an expert operator now working in England, and of great value to those who may be occasionally called upon to carry out this operation in India. The author advocates the use of Doyen's mouth gag a blunt guillotine of special pattern total enucleation of the tonsil by pressing the tonsil well home into the guillotine by a finger pressing upon it from below the angle of the jaw, and deals with the measures necessary to control hæmorrhage and other complications. Lt-Col L Cooke contributes an interesting paper on "tennis elbow" which will be of interest to both victims of and medical men called upon to treat this distressing affliction. He advocates fomentations, massage, strapping and the continued use rather than rest of the injured arm.

With regard to *Antiseptics* the introduction of Electrolytic Chlorogen as a surgical antiseptic may prove invaluable to general surgeons in India. Lt-Col N W Mackworth describes the results after one year's use of the solution at Muzaffarpur, and comments on the great saving which it effects in the hospital drug bill. Mr C M Hutchinson contrasts its stable and keeping qualities with those of other commercial chlorine preparations. Dr Michael details cases of sepsis of different types treated solely with the new antiseptic. "E C" differs from the other chlorine solutions in its very considerable stability and standard available chlorine content under Indian hot weather conditions this falls from 25 per cent. to only 2 per cent. in six weeks and the latter percentage is maintained for six months. The cost of production with the standard

apparatus, with supplies of brisair salt and lime and current at six annas per unit is only 4 annas per gallon. "E C" is made by electrolysis of a 20 to 25 per cent brine solution, and stability is secured by the addition of lime. We understand that official arrangements have been made to issue the apparatus, made from the official specifications under proper control but that, at the moment of writing the only reliable supplies are those made at the Imperial Research Institute, Pusa. It is important that the right type of electrolytic cell be used in order that a stable solution be produced.

With regard to *Anæsthetics* Major F W Porter, R.A.M.C. (ret'd), draws attention to the value, the ease and the importance of spinal anæsthesia in a country such as India where the surgeon has often to operate single-handed, and not infrequently under adverse conditions in the bazaar. He does not hesitate to use the Trendelenberg position in spinal anæsthesia. The method is one certainly deserving of more general use in India. Lt-Col A Hooton draws attention to the use of the "Ether Bomb" of Dr Pinson, assistant anæsthetist to the Manchester Royal Infirmary. This simple apparatus is fool-proof, generates ether vapour at a pressure of 97 lbs per square inch, and the vapour is led off and administered through an ordinary mask. He advises induction with chloroform by a Junker apparatus and once anæsthesia has been established the ether bomb may be used to continue it the expenditure being about 5 to 6 ozs of ether per hour. There is no necessity to use ultra-refined brands of ether cheaper brands such as "Macfarlane's blue label 720" at 2/6 to 3/- per lb and "May and Baker's anæsthetic ether" being equally reliable. The saving in expenditure as compared with the use either of chloroform on an open mask—(a method which is far more dangerous)—or of Ether purificatus, B P is enormous.

HYGIENE AND ALLIED SUBJECTS

Ankylostomiasis—Increasing attention has been given to this most important of Indian problems in 1922. The Rockefeller Foundation continued the campaign in South India under Drs Paul and Kendrick, started in 1920. In Cannanore Central Jail with a population of about 1,000 or more they found a 90 per cent. infestation. Two treatments cleared 94 per cent. of cases, four treatments being needed before 100 per cent were cured. Such a jail can be rendered hookworm-free in some 2½ months' work. Of patients in head-quarter hospitals 78 per cent were found infected. Tea coolies gave figures ranging from 83 per cent. in Wynaad and the Nilgiris to 100 per cent. in Malabar and Kanara. In schools it was found that 56 per cent. of the children were infected as against 16 per cent. of the teachers. Eighty-seven per cent. of the students at the Madras Medical College coming from the moffusil were infected as against 55 per cent. of those from Madras City. The problem of hookworm eradication in India is how to make a safe latrine more attractive and more easily accessible to the villager than is the nearest patch of jungle. The enquiry into anthelmintics by the Rev Father J F Caius and Dr K. S. Mhaskar was continued, and various drugs investigated. Extract. filicis liq has an admissible dose of 90 minims, but its value is poor. Kousoo, Kamala, Pulv. Arece and the salicylic acid derivatives are of little, if any, use. Esterification of thymol and of b naphthol leads to loss of their vermifugal properties. The propenyl phenols are good anthelmintics, their activity being associated with the phenol groups. Cure in hookworm infections is sometimes not immediate, but may follow at some considerable interval after the administration of the vermifuge. Dr Mhaskar contributes an article on mass treatment of hookworm infections. One dose treatments with 40 to 50 grams of thymol were given to some 5,900 persons. 2,500 were treated with a similar single dose of b naphthol, and 2,200 with chenopodium. He states that chenopodium is efficient but troublesome to

administer and not free from risk, and advocates the single dose method with either 40 grs of thymol or b naphthol. This gives a 93 per cent cure rate. The cost is one anna and nine pies for thymol and eight pies for b naphthol. The dangers of mass treatment with such a large dose of thymol, however, seem to be rather under estimated.

Hall's discovery of the value of carbon tetrachloride in animal ankylostomiasis has led to the investigation of its possibilities with regard to hookworm infection in man. Tests are being made at Calcutta as to dosage, modes of administration, and in particular as to any after-effects on the liver, as it has been reported from America that this drug, which is otherwise a very cheap and most efficient vermifuge for *ankylostoma* and *oxyuris* infections, may possibly cause friability and atrophy of the liver. Dr J B McVail reports very successful results with either 60 minims of CCl₄ in hard gelatine capsules or with a mixture of 50 minims of CCl₄ and 10 of oil of chenopodium.

Khalil in British Guiana and McVail in Calcutta have independently shewn that septic tanks do not destroy hookworm ova and that ova are found in the unfiltered and larvæ in the filtered effluent. The Government of Bengal have instituted tanks specially designed to prevent this,—so far with very promising experimental results. Dr McVail also comments on the great power of destruction of the direct hot Indian sunlight on the development of ankylostome larvæ in the soil. Intensive treatment of an infected population should therefore be carried out by preference during the hot weather, which affords the best time of the year for maximal results. The same author also comments on the presence of a low eosinophile count in hookworm-infected patients suffering from other and severe complications. In this country ankylostomiasis plus kala-azar often shews a low eosinophile count.

Infant mortality is still one of the most pressing Indian questions. Thus the figures for Delhi were 232 deaths per 1,000 in 1920, and 268 in 1919. In Calcutta 386 and 357 for the same years. Defective registration of births may possibly account for a portion of this terrible total, but the main factor is "dirty midwifery". Miss Curjel records the results of investigations into the normal weight curve of Indian infants: at birth males weighed on an average 6½ lbs, girls about 6 lbs. The gain in weight was at the rate of about four ounces per week for the first six months, and at twelve months of age the average weight about sixteen lbs. The same author contributes a careful study of measures adopted or wanting for the care of women and children in different Indian industries. The establishment of Lady Reading's Women of India Fund in 1922 aims at three objectives — to financially and otherwise assist the Hardinge Medical College for Women at Delhi, to create a new hill hospital for Indian women patients, and to create an All-India Nursing Association for Indians. The Fund has been liberally supported and its activities may do immense good in India.

Water Supplies—The introduction of electrolytic chlorogen renders possible the efficient sterilisation of water supplies by chlorination at a low cost and without the all-too prevalent "chlorine taste". During cholera and other water-borne epidemics wells can be chlorinated at a cost of less than one anna each, and large bathing tanks at a cost of some Rs 15 to Rs 25. The two most important features of "E C" are its relatively stability of available chlorine content under Indian hot weather conditions, and its cheap cost of production.

Tube Wells—Major A D Stewart describes the introduction into and use of tube wells in Bengal. The mode of boring found best is that where the outer tube body is withdrawn after boring and replaced by an inside tube and strainer. It is important that the water supply used for the water jet adopted to loosen soil in boring shall be unimpeachable otherwise it may contaminate the newly bored well. The cost of such tube wells is small, approximately Re 1 per

gallon per hour and a yield of 5,000 gallons per hour can be obtained for an expenditure of Rs 5,000. Hardness varies very much in even the same strata in Bengal but such wells often yield an abundant, cool and absolutely sterile water supply at a cheap rate. Even wells contaminated in construction often clear to complete bacterial sterility in 3 to 5 months. Dr T Bishop comments on the use of tube wells during cholera epidemics and their value in railway stations and camps. The whole question of tube wells is one which is at present attracting considerable attention in India, and one which the practical sanitarian should bear constantly in mind.

Dr V G Raju records the results of investigations with regard to *Water-purification*. Working on the seasonal changes and chemical composition of river and tank waters, he finds that up to a certain point the hardness of a water is inversely proportional to its suspended matter content, and that when the hardness is above 20 parts per 100,000 the water possesses remarkable properties of self-clarification without the addition of coagulants, etc. Also, other factors being equal, the harder the water the less the dose of coagulant needed for its clarification. The same author investigated the bacterial efficiency of slow sand filters. When suitably designed such filters are able to purify an initially highly polluted water to the extent of securing absence of faecal bacilli in 50 cc. Yet in many large filter plants, in spite of expert management, results are bad and are often not consistent. This may be due to either defects in design or failure to clarify the water before passing it into the filter. Special attention was paid to the algal flora of such filters. *Oscillaria amphibia* was found to form large adherent algal layers which rapidly block a filter. Other genera, such as *Spirogyra*, *Cladophora*, etc. form large branched, tree-like masses with blocking effect. *Volvox* very quickly blocks a filter. The interesting observation was made that algal life is entirely suppressed if turbid water be allowed to pass through the filter, but a lack of algal life leads to lower bacterial efficiency, and—up to a certain extent—algæ are beneficial. It is important in the management of sand filters to avoid too frequent scrapings. The question of keeping algal growth within bounds is engaging attention, also the effect of covering the filter from light and air during its period of service. Dr Raju also comments on certain limitations in the B. coli standard for water purity. An undoubted multiplication of faecal bacilli takes place under such conditions as storage in reservoirs or passage through pipes and such increase should not necessarily be attributed to faecal pollution. The presence of frogs in some Indian supplies is said to be responsible for B. coli findings.

Vaccination—Lt-Colonel J Cunningham and Major J A Cruickshank comment on the necessity for a standard for vaccine lymph, and describe a method of standardisation which depends on dilution of the lymph to various strengths until discrete vesiculation is obtained. Lt-Colonel W F Harvey favours Nyland's method by which three species of vaccifer are used, the rabbit to provide lymph for the cow calf and the latter to provide lymph for the buffalo. By adhering to this method lymph of good potency and good keeping properties in a tropical climate is ensured. Dr Mhaskar gives an interesting account of the experiments at Belgaum towards obtaining a less septic lymph. A bacterial vaccine was made from the bacteria usually found in vaccinal lymph and was used to immunise the vaccifer animals. The vaccine lymph from these animals gave 25 to 1,000 bacterial colonies on plating as against 100,000 or more in the non-immunised controls. The annual 1920-21 report of the Vaccine Section of the King Institute, Gundy is full of interesting reading. The attempt to use a chloroformed glycerine lymph in the Madras Presidency in July and August was not attended with success, but Colonel Cunningham says that these results must

not be taken to prejudice the case against glycerinated lymph in India.

In Sewage Disposal—Mr K B Dadyburjoo describes a modified sewerage system, in which the gases from septic tanks can be used for municipal lighting and other purposes. Dr J L Das finds that in the densely populated areas of Bengal the nitrifying organisms multiply so rapidly in trenched soil that the soil does not become sewage sick, and can be retrenched with safety every 5 to 6 months. The importance and necessity of international co-operation in preventive medicine and hygiene is becoming more widely recognised and the results of the *Anthrax Committee* now sitting in London should be of interest. Major A D Stewart describes in detail the proper technique for the recovery of anthrax bacilli from suspected shaving brushes, the mouse test being the most delicate of all. The visit of Lt-Colonel Norman White to the East in connection with the spread of epidemics should be of great importance to India. An important advance has been made in Bengal during the year by the introduction of extensions and alterations to the existing *Factory Act*, whereby the age for child labour has been raised and the lengths of labour shift reduced. The *Bengal Food and Drugs Adulteration Act* of 1919 has been extended and has become more widely known and understood and taken advantage of. Dr A Hamid sets forth the result of years of painstaking work in a scheme for the *Medical Inspection of Schools* and notes the special requirements and difficulties met with in this connection in work in India. Colonel P F Lelean, R.A.M.C. describes a simple sack steam disinfecter, which was exhibited at the Indian Science Congress by Major L A P Anderson. Lt-Colonel J W Cornwall discusses the ultimate aim of medical research, the main effort of which should be directed towards the discovery of the conditions which permit a disturbance of the functions of the organs of the body to occur, pathological and therapeutical studies which have not this end in view are of secondary importance.

OPHTHALMOLOGY

THE discussion on capsulotomy versus expression in *Cataract* still continues, the chief protagonists being Major R. E. Wright and Major F. Strother Smith. The case for capsulotomy is most ably presented by Major Wright in the report for 1921 of the Madras Government Ophthalmic Hospital, emphasis being laid on the value of retention of the posterior membrane of the capsule as a guard against septic infection of the vitreous. Major Strother Smith details important points in the technique of the expression operation, and promises publication of ascertained end results several years after operation. The truth of the matter appears to be that the technique of operation is not of such importance as the skill and experience of the operator. Barraquer's apparatus is still on trial at Madras, but seems to have yielded disappointing results in the special class of cases for which it was hoped that it would be particularly useful, immature and difficult cataracts. Dr H T Holland, writing as an experienced intracapsular operator and on an analysis of 8,000 cases details the contraindications to the intracapsular operation, congenital, secondary and juvenile cataracts, exophthalmos, cases which resist legitimate pressure in extraction, glaucomatous and traumatic cataracts. The publication of Lt-Colonel E A R. Newman's book on irrigation in cataract extraction is an event of the year, he advocates hyoscine to keep the patient quiet, iridectomy, capsulotomy and subsequent irrigation. Colonel Henry Smith's oration on ophthalmology at the Ohio State Medical Association in May 1921 has been published, and the *American Journal of Ophthalmology* for February and March 1922 deals in a fair, impartial and admirable manner with the results of Colonel Smith's American series. Writing to the *Lancet* (4/2/22) he emphasises the value of failing distant

vision as an early sign of commencing cataract, and the use of cyanide of mercury injections where the sight is still 6/10ths. Dr R P Ratnakar advocates iridotomy plus capsulotomy in cataract, two methods of doing the iridotomy being described. Lt-Colonel W V Coppinger records an exceedingly interesting case of cataract in a child following a stroke by lightning, and Lt-Colonel H Kirkpatrick (B.M. 125/3/22) contributes a most useful paper on the etiology of cataract. The condition is usually bilateral, is usually more advanced if either eye shows refraction errors in that eye than in the other, and hereditary predisposition, glare, loss of vitamins from the dietary, premature senility among Indians, diabetes, rickets, pellagra may all be predisposing causes.

Major R E Wright advocates a modified Greenwood operation for extirpation of the lacrimal sac, and records two very interesting cases of infection of the conjunctiva and of the lacrimal sac with *Rhinosporidium lunali*. His researches into the causation of keratomalacia are of great importance. The factors concerned appear to be a diet unsuitable or insufficient in quality or quantity, loss of accessory food factors, damage to the intestinal absorbing surfaces, which are followed by inefficiency of the liver and specialised degenerations amongst which keratomalacia is included. Dr S K Ganguly records interesting cases of optic atrophy after cholera, quinine amblyopia and spontaneous absorption of the crystalline lens. It is now clear that all cases of quinine amblyopia are not due to quinine, some appear to be due rather to embolism and blockage of the retinal vessels with malarial schizonts of *P. falciparum*.

OBSTETRICS AND GYNAECOLOGY

Eclampsia—Ever an important subject in India is dealt with by Major C A Hingston and Dr A L Mudaliar, who analyse 459 cases treated in Madras between 1908 and 1922. They advocate a careful watch upon the blood pressure, after as well as before and during delivery. It should not be allowed to exceed 120 mm. Venesection or hypodermic veratrine is recommended. As a rule the less interference the better, but instrumental delivery may be resorted to with the os 4/5ths open and a blood pressure of 120 mm. The temperature should be reduced by iced enemata. Eclampsia patients should be treated in a special room which is kept dark and where everything is always kept ready for these cases. During the 14 years analysed there was a 1.38 per cent incidence of eclampsia, 459 out of 33,000 labours. The death-rate was 17.6 per cent. The causes of the frequency of eclampsia in India constitutes an interesting biochemical problem which is as yet unsolved. Lt-Col W S Williams studies retention and adhesion of the membranes which he considers to be a very important cause of *Post-partum Haemorrhage*. In a series of 96 labours this condition occurred in 16. Its effects vary, sometimes there is surprisingly little in the way of complications as a result, sometimes the sequelae are very grave. Intrauterine douches administered with the aid of a speculum and not blindly are the sheet anchor of treatment. This condition, as apart from mere retention of the placenta, is one the importance of which is not sufficiently realised. Among several isolated papers dealing with individual cases mention may be made of Lt-Col C B McConaghy's case of immense ovarian cyst which weighed 84 lbs after tapping and contained 11 gallons of fluid, and Dr M Allam's case of obstructed and difficult delivery due to hydrothorax and ascites in the foetus.

VACCINE THERAPY, BACTERIOLOGY, PATHOLOGY

Lt-Col W F Harvey and Capt K R K. Iyengar contribute a valuable series of papers dealing with certain problems in connection with vaccine therapy. *B. avisepticus* was taken as a standard organism for study. It loses its virulence on subculture on agar, but retains it on subculture on blood agar, and this factor may be of importance in vaccine

preparation Vaccines made from avirulent strains produced as much agglutinin response as did those from virulent strains, but the latter gave slightly better immunity against disease in experimental birds. If pigeons be immunised by repeated intravenous doses for 12 months the immunity mechanism appears to run down and the titre becomes low if now a minimal dose be given, however, 1/10th to 1/12th of the usual, there is a marked immediate agglutinin response in the birds. Sealed cultures of *B. avisepticus* retained their vitality and virulence for 12 months at room temperature, and a *B. avisepticus* vaccine does not lose its potency under ordinary conditions of room temperature and keeping in from 6 to 9 months. If a given dose of vaccine be administered in divided (intravenous) doses instead of in a single (intravenous) dose the agglutinin and immunity response is improved. If the dose be given in two halves results are better than with the single total dose given as three portions a better result is obtained than with the half doses. The same authors also contribute a note on the preparation and use of desiccated culture media in India. Capt Iyengar, studying the Wassermann reaction, found it negative in tuberculosis, and positive in 22 per cent of a general unselected Indian population, 88 out of 400 examined. Dr L. E. Napier comments on how to carry out the *Differential Leucocyte Count*. Results with the ordinary procedure are so extremely varied, even where the personal factor is eliminated, as to be almost entirely useless and even misleading. Only two methods give any real approach to uniformity of findings either to take an exceedingly minute drop of blood spread as a very tiny film and record every leucocyte within it or to count by working along horizontal lines from beginning to end of the middle of the film. Major W. L. Forsyth writes on three cases of *Primary Carcinoma of the Liver*. Ascites is relatively common in India and hepatic cirrhosis seems frequently associated with amœbic dysentery and is often seen in non-alcohol-takers. The histopathology of a case is fully recorded and the author discusses the relationship of primary carcinoma of the liver to cirrhosis and possibly to amœbic hepatitis. Lt-Colonel J. Cunningham's presidential address at the Medical Section of the Indian Science Congress, 1922, on India's debt to medical research is an essay full of historical and present-day interest so great has been our advance in a single century that we have almost lost our power of proper appreciation and take discovery for granted.

MISCELLANEA

In *Radiology* and allied subjects the opening of the new Government X-ray Institute at the Madras General Hospital is the first event of the year. The new institute is in the capable hands of Capt Barnard, R.A.M.C. (T.C.), whose valuable X-ray work during the war was much appreciated by many who availed themselves of it. The growth of X-ray work at Madras has risen from 2,345 examinations in 1918 to 7,315 in 1921. Major J. A. Shorten read an exceedingly interesting address on *Diathermy* at the Medical Section of the Asiatic Society of Bengal. Both general and local diathermy methods were demonstrated and its use in both medicine and surgery described. Scars, arthritis, chronic synovitis, peripheral neuritis and chronic gonorrhœa are only a few out of very many conditions where diathermy is of very material assistance. On the surgical side the advantages of a bloodless operation and absolute sterility are immense and the method is of very great value especially in operating on oral and laryngeal growths. With regard to *Pharmacology* our columns for the year have shewn the progress made in India to be very real. The opening of a real pharmacological laboratory fitted for research investigations at the Calcutta School of Tropical Medicine renders enquiries possible which were hitherto neglected questions relating to indigenous Indian drugs, and the possibility of proper scientific investigation of those with an established reputation. India's cinchona

resources, the possibility of a standard Indian Pharmacopœia, the possibility of rendering India far more self-supporting than at present in her drug requirements and kindred subjects have been dealt with by Major R. N. Chopra and Dr B. N. Ghosh. Mr B. N. Dutt draws attention to the fact that the blister beetle of Gwalior, *Mylabris chionura*, gives a higher cantharidine yield than that of the European insect and asks why India should not manufacture her own requirements of cantharides. Dr G. C. Ramsay draws attention to *Combretum pilosum* (Roxb.), which grows in Assam, and which he has found to be a fairly efficient vermifuge for *Ascaris* and hookworm and reports that he is now independent of costly santonin supplies.

In *Entomology* the year has been marked by the publication of many papers of special interest to the research worker, but some of them of less interest to the general reader. Major J. A. Sinton details the *Phlebotomy* and *Anopheles* of Waziristan whilst the appearance of Mr F. W. Edwards' splendid new synopsis of the adult oriental Culicine mosquitoes introduces order clarity and accuracy into a confused subject. Lt-Colonel S. R. Christophers contributes a careful and detailed paper on the development and structure of the terminal abdominal segments and hypopygium of the mosquito. Lt-Colonel W. S. Patton, among a plethora of splendid entomological monographs, records a case of intestinal myiasis due to the larvæ of a blood sucking muscidæ, *Phlebotomyia crassirostris*, and details two cases of cutaneous myiasis due to sarcophagous larvæ. Both the scientific worker and the general reader will appreciate his use of a tame cow as an involuntary insect assistant to collect specimens of all the blood sucking diptera of a locality and his interesting suggestion that such an animal should be on the staff of every research institute.

The reviewer begs to apologise to the reader for the length of this review but trusts that the importance of the field covered justifies its length. He also trusts that he has presented the papers dealt with without misrepresentation or inaccuracy and begs, in anticipation, that critics will be merciful. It may be claimed in conclusion, that the year 1922 shews medical and surgical practice and research work in India to be still in a state of healthy and by no means suspended animation.

R. KNOWLES

Current Topics.

Plague. A Review.

In the *Tropical Diseases' Bulletin* there have recently appeared several useful reviews of recent work in connection with certain subjects. Plague is dealt with in the number for August 1922 by Col. Tull Walsh, R.M.S. (ret'd). Several points of interest occur in the review.

Various animals besides the rat have been found to be reservoirs of the disease, ground squirrels in California, marmots in North China, the gerbil and a mouse in South Africa. The work of Bacot and Martin in 1914 is pretty well generally known in the medical world by this time and it is now generally accepted that infection from the flea to man is conveyed, not by the patient scratching the bite, but by regurgitation of the infected gastric contents of the flea. This happens whilst the insect is attempting to overcome the obstruction caused by a plug of clotted blood swarming with bacilli in the proventriculus.

The most interesting recent work on the rat flea is that of Major Cragg. He finds that the prevailing flea in those parts of India which are liable to severe plague epidemics is the *Xenopsylla cheopis*. In places like Burma which have never been visited by plague

the prevailing kind is *Y. astia* which does not bite man so readily as does *Y. cheopis*.

Stress is laid on the difficulty of diagnosing pneumonic plague, especially if other forms of pneumonia are occurring in the place at the same time. The most significant points are the rapidity with which the fatal result follows the insignificance of the physical signs at the beginning and the occurrence of a watery sputum instead of a viscid sputum also the fact that the sputum is very bloody.

Whilst in ordinary rat plague the site of infection is usually in the legs, so that the groin glands are involved it is noticed that the axillary and cervical glands are the ones most commonly involved in plague occurring amongst people engaged in skinning infected marmots and squirrels. The mortality in these cases is higher than in the cases arising from rat infection.

There is increasing evidence of the value of anti-plague serum in the treatment of the disease and also of the value of inoculation with anti-plague vaccine in the prevention of the disease.

There is no mention of the important work which has recently been carried out in India by Kunhardt and others on the possibility of stamping out plague by rat destruction in the places in which the disease is carried over in the off-season. This subject is dealt with elsewhere in this issue.

Report (abbreviated) on the Plague Operations in Belgaum and Dharwar Districts 1920

By C STRICKLAND, M.A., B.C.

Obtainable from the Officer-in-Charge, Bombay Govt Publications, Poona Superintendent, Govt Printing

This is an extremely interesting and valuable account by Dr Strickland (now Professor of Entomology at the Calcutta School of Tropical Medicine) of a great experiment conducted by the Bombay Government to combat plague. There was good reason for carrying out the experiment. Since 1896 when the first case of the present series of epidemics was imported from Hongkong 2,397,383 deaths from plague have been reported in the Bombay Presidency (exclusive of Baroda State), whilst in the two districts Belgaum and Dharwar which were the chosen scene of the experiment an average of nearly 20,000 per annum or 10 per mille of the population have died from the disease. Indeed in the four years 1901-1904 the appalling mortality of 10 per cent of the population occurred.

The scheme of operations was drawn up by Lt.-Col F H G Hutchinson I.M.S. now Public Health Commissioner Government of India and by Lt.-Col W O'S Murphy, I.M.S. Director of Public Health with the Government of Bombay. It was of course based primarily on the findings of the great Indian Plague Commission of 1905 but the subsequent elaboration of these findings by Major Kunhardt, I.M.S. particularly in so far as concerned the phenomenon of the "carrying over" of plague from one year to another was the real mainspring of the scheme. Kunhardt had asserted that the chance of any plague-infected place "carrying over" could be predicted with certainty by merely considering its size and the date of infection—the bigger a place or the later its date of infection the greater its chance of "carrying over." The corollary to this was that only such places as had been noted down as having any chance of carrying over should be operated on during the off-season with anti-plague measures these if successful would ensure that no place would carry over and so restart the epidemic in the plague season over the whole countryside.

However Kunhardt's doctrines were not altogether relied upon for the scheme included an extensive campaign in the fifteen largest grain marts of the two districts whether or not they should happen to come on the list of places predicted to carry over. The ob-

ject was to reduce their chances of infection from a distance, which they possessed by reason of their trade in grain from outside the districts, for should they become thus infected, a large number of the villages trading with them could hardly hope to escape.

But no scheme, however well-thought out, could succeed if the anti-plague measures relied upon were inefficient. Thus the experiment was as much a test of the available measures as of the soundness of the scheme. Kunhardt and Chitre at the Poona Plague Prevention Enquiry Office had improved beyond all recognition as far as could be shewn in laboratory—godown experiments the efficiency of the French "Wonder" trap and they had also shewn the great superiority of barium carbonate as the best rat poison. The battle was therefore fought with these two weapons—18,000 rat traps (the best construction was by the Army and Navy Cooperative Society, Calcutta), and many tons of barium carbonate and the cost of it was about 1½ lakhs, or as it turned out about Re 1 for every 35 rats killed a cost necessarily high in the first year of operations.

In 1920 the end in view was not attained, but then the main condition of the scheme was not fulfilled, in that the places predicted to carry over were not all subjected to anti-plague measures. The reason for this was the impossibility of collecting quickly such a large number of rat traps, as well as of training at short notice a larger expert staff. It therefore now remains to discuss whether the measures which were actually carried out had any beneficial effect.

Of the fifteen big grain marts, four with an aggregate population of about 130,000 people had been included in the list of places predicted to carry over. Of them three, Belgaum, Dharwar, and Hubli had a considerable amount of work conducted in them during the off-season—although only about 16 per cent of what they should have had—and the results were excellent even though these marts were surrounded by infected villages later in the year. Thirty-four was the total number of cases they suffered. The other big town operated in—Gadag—did not shew the same success as it suffered from a small epidemic of four per mille of the people, but then the anti-plague measures were started here very late in the off-season. Of the "carrying over" villages operated in to some extent during the off-season 50 per cent carried over, while of ten not operated in at all, 70 per cent developed plague in the plague season. The work in the 15 big grain centres, apart from those mentioned above, proved nothing.

Of seven other selected grain centres, three were operated in and did not develop subsequent infection, whilst of the remaining four not operated in 50 per cent did so.

Of forty-nine places, important because of their proximity to plague villages during the off-season (a very dangerous situation), only 10 per cent. after operation developed plague (total cases 11), while 75 per cent. of those in which no operations were undertaken developed plague. Of 65 places important because of their proximity to plague villages during the plague season, the corresponding figures per cent were 4 per cent and 24 per cent.

It will be seen therefore that in every class of place the results which were properly controlled were most encouraging and as the operations in no case reached anything like the standard which would have been followed if possible, the inference that the new anti-plague measures formulated by Kunhardt and Chitre are thoroughly effective is justified.

The importance of such a test as the above is obvious, and it is a thousand pities that Dr Strickland or some other competent person should not have an opportunity of continuing the experiment. The results already obtained are extremely promising and if the experience gained in actual practice were utilized it is safe to predict that plague control is a perfectly practical proposition. Dr Strickland is to be congratulated on the work done and the excellent report under review.

Some Notes on the Treatment of Leprosy.

By DR. E. E. MUIR,

Leprosy Research Worker, Calcutta School of Tropical Medicine

THERE has been some small advance in the treatment of leprosy during 1922. The esters of hydnocarpus oil have been used in leper colonies scattered over India with results varying with the amount of care and understanding that it has been possible to exercise by those using them. The treatment of leprosy is not such a simple matter that anyone can carry it out without special training and experience, and if the best results are to be had each individual case must be considered separately and studied carefully. Lately we have found that the best way to use these esters is by the infiltration method, injecting the drug into the subcutaneous tissue so as to bring it into the closest possible contact with lepra bacilli in the skin. The following is the method we have adopted—

An area of leprosy skin about three inches in diameter is chosen and infiltrated from its two poles. We use a 1 in 5 dilution mixing the esters in the following way—Hydnocarpus esters 1 cc, Olive Oil (sterilised by boiling on a water bath for half an hour and free from fatty acids), 35 cc, Creasote (doubly distilled), 0.5 cc, Camphor, 0.5 gram. We inject this mixture in doses gradually rising to 4 cc into the chosen area. The needle (1½ inches long, fine, sharp and smooth), is inserted at one pole to its full extent in the subcutaneous tissue and one-eighth of the amount of the mixture to be injected is pressed out of the syringe. The needle is then withdrawn till its point is just still inside the skin and it is then re-inserted at a different angle. This is again twice repeated so that four injections have been made in four different directions with only one puncture of the skin. The drug runs back along the line of the needle to a certain extent and in this way one-half of the chosen area has been infiltrated. The same is then repeated from the other pole of the area. The two puncture points are pressed upon with cotton wool soaked in alcohol for a few minutes to prevent escape of the mixture, whilst the infiltrated area is gently massaged with the fingers. This method of injection is accompanied with only slight pain and may be rendered absolutely painless by freezing the area with ethyl chloride. The advantages over intramuscular injection are—(1) That the drug is brought into close contact with the lepra bacilli and appears to act directly on them. (2) Toxins are thereby set free which tend to form antitoxins. (3) The more diffuse distribution of the drug tends to greater and quicker absorption. (4) Besides the specific action of the drug there is a well-directed counter irritation. (5) A greater effect is obtained with a smaller quantity of the esters. (6) After the first few seconds there is as a rule no pain and even this can be done away with by freezing the part. Such injections may be given several times a week as long as no severe reaction is threatened and the whole of the lepomatous areas of the body can gradually be infiltrated. We have noticed that depigmented areas become hyper-pigmented after infiltration and then the hyper-pigmentation gradually subsides leaving a more or less normal colour. Anæsthetic areas which have resisted the intramuscular injections regain sensation much more rapidly. Areas of thick leprotic tissue full of lepra cells swell up after their infiltration and then as the reaction passes off, they show a tendency to more or less rapid resolution.

Another point that must be kept clearly in mind if success in the treatment of leprosy is to be attained is that the healthy human body does not as a rule form a suitable soil for the growth of the lepra bacillus, and that the development of the disease is generally the result of a departure from a healthy state. We have found in Bengal that innumerable people are suffering from leprosy in its initial stages. In a certain school out of the menial staff of about 60 four were found

to be suffering from the disease and possibly a more systematic search might have revealed even more. These were not apparent lepers but there was no doubt about the diagnosis. There is no reason to believe that in this instance the number of lepers was larger than in other institutions in Bengal or in other parts of India. The conclusion, however, is that many people suffer from initial leprosy and that the disease either heals spontaneously or at least does not develop into a severer form of the disease, as their bodies are healthy and do not form a suitable soil for the lepra bacillus.

Our study of the history of lepers, especially of the intelligent lepers attending our out-patient dispensary, is that where the disease has advanced beyond the early stages it is due to the body having departed from its healthy state and having become the seat of some chronic or debilitating disease which has rendered it a suitable soil for the lepra bacillus to grow in.

One of the diseases most responsible for this spread of leprosy is syphilis and we have come across innumerable cases where previous to an attack of syphilis there had only been slight initial lesions for some years or there had been no signs of leprosy noticed at all, whereas the attack of syphilis was quickly followed by a rapid extension of leprosy throughout the body. Another disease which seems a common cause of aggravation of leprosy in India is hookworm. In five leper asylums where the stools were examined for hookworm the infection varied from 85 to 95 per cent. Chronic indigestion, constipation or unsuitable diet also markedly increase the disease.

Keeping these facts in mind it will be apparent that there is little sense in treating the leper whilst the departure from health or the accompanying disease, which has rendered the body a suitable soil for the growth of the lepra bacillus, remains unremedied. The first essential therefore in the treatment of leprosy is to find out this secondary cause, and if possible get rid of it.

The Treatment of Typhoid.

At a meeting of the Medical Section of the Asiatic Society of Bengal on the 11th October, 1922, Lt-Col F. A. F. Barnardo, C.I.E., C.B.E., I.M.S., read a paper "On the Management of Typhoid Cases, with a note on the Causation of Hæmorrhage in the Enteric Fevers."

Colonel Barnardo first described the unique opportunities which he had had for the study of enteric fevers. In the South African war he had seen over 900 cases in two years, with an 18 per cent mortality. In India he had collected notes of 422 cases prior to the great war. At Bombay during the war 1,004 British and 17,000 Indian cases of the enteric group had passed through his hands. In the recent third Afghan war and during a tour of inspection of the hospitals throughout India and Burma he had seen 447 cases and 36 cases whilst Civil Surgeon, Simla. In all of 30,414 cases which had come under his notice during 23 years of medical practice, he had careful and detailed records of 5,436, which he had studied.

Admitting the difficulty of the clinical diagnosis of enteric fever—especially in the inoculated—there were five cardinal signs of infection by this group, as given by Garrow *viz*—(1) continued remittant pyrexia ending by lysis, (2) a low pulse to temperature ratio, (3) toxæmia and stupor, (4) enlargement of the spleen, and (5) rose spots in the abdominal area between the nipples and the iliac crest. Typhoid fever, in his experience, was always true to type. "atypical typhoid" being largely a myth due to the pathologist. Bedside data were better than a positive 1 in 40 Widal reaction. The pathologist scores over the clinician chiefly by virtue of the fact that the former keeps careful records of ascertained facts whereas the latter relies on the general trend of clinical experience which is based only on a record of

impressions Blood cultures afforded the one positive proof in laboratory diagnosis of the enteric group

The enteric fevers might be classified as bacillæmias. The usual view was that the bacillæmia occurred *via* the Peyer's patches. Besredka, however, views typhoid fever as an intestinal infection only and regards the intact intestinal mucosa as the chief defensive mechanism against bacillæmia and consequent fever. Hence he had advised discontinuance of T A B inoculation in the French Army. In the subsequent twelve months the French had 73 000 cases of enteric as against the British 4 000 among armies of equal strength. The role of healthy bile in cleansing the intestinal mucosa was important. Agglutinins gave no clue to immunity in animals treated orally with Besredka vaccines a solid immunity might be produced but no agglutinins result in the serum.

Sir A E Wright originally suggested that the path of invasion in typhoid was as follows—Ingested bacilli in lymph stream—spleen—where a phagocytic struggle ensued—blood stream—all tissues—the lungs (whence the broncho pneumonia of the disease)—skin (with roseola)—meninges—intestines—lymphoid and Peyer's patches.

An exceptional opportunity for P M examination of typhoid cases had occurred when sixteen such cases were suffocated in a burning tent. Examination showed that whereas typhoid bacilli were recovered from the skin lungs etc the ulceration and sloughing were especially associated with septic cocci. Sometimes the B typhosus appears to be entirely eliminated and only streptococci and staphylococci found in the lesions lesions which may extend as far as the peritoneal coat. The blood vessel walls were invaded by cocci thrombosis occurred and septicæmia, not of B typhosus but of streptococci and the like occurred.

Clinically with the onset of hæmorrhage certain valuable premonitory symptoms and signs were to be noted. These are—(1) a transitory fall in the temperature (2) a great acceleration in the pulse rate—the clinical picture changing from that of typhoid to that of a septicæmia. Associated with these are noted—(3) a marked polyuria and (4) a sudden rise of blood pressure. Hæmorrhage follows a few hours or so later. In 128 cases with hæmorrhage the blood pressure prior to hæmorrhage rose from 60–70 mm to 110–140 mm. In an Arabian epidemic with 9 per cent of cases of hæmorrhage, every such case showed a raised blood pressure.

Of hæmorrhagic cases where blood cultures had been taken streptococci were found in 125 cases alone—of which 90 died staphylococci in 35 cases—of which nine died and mixed streptococci and typhoid bacilli in seven cases—of which six died. The streptococci were of the hæmolytic type.

Fourteen years ago the treatment of typhoid was a policy of drift and even Osler commented on the supposed uselessness of drugs. To-day the general practitioner still maintained this utterly erroneous and ignorant attitude towards the disease. With such an 'expectant attitude' the mortality in true typhoid fever is from 18 to 20 per cent. With proper treatment however it can be reduced to 4 per cent. or even lower.

Two cardinal principles stand out in the treatment of typhoid fever *vis*—(a) an intelligent anticipation of events (b) the necessity of giving drugs in really therapeutic doses. The last 140 cases at the Medical College Hospital had shown a mortality of only 4 per cent. The following were the essential points in rational treatment—(1) The temperature must never be allowed to exceed 102.5°F which is the 'natural' balanced temperature of a typhoid case. Incessant sponging with hot water should be resorted to. The temperature must be kept down to 102.5°F no matter what the strain on the nursing staff. A higher temperature meant a toxæmia due to absorption of toxins, or a septicæmia due to streptococci, staphy-

lococci or even B coli. Vaccine and serum therapy were of little if any use. Fifty cases were treated with immune serum with little benefit. 720 on hospital ships with vaccines, with no improvement. He attached no clinical importance whatever to the Widal reaction. Even if 48 hours continuous sponging were necessary, the temperature must be reduced to 102.5°F at which level he drew a red line across the temperature charts of his enteric cases. (2) Secondly the state of the intestinal mucosa—the natural line of defence of the body—must receive attention. A daily enemata is advisable but soap should not be used, as it will remove much needed calcium salts and lead to urticaria.

The amount of urine passed is important. It should be free in the early stages. Sudden polyuria late in the disease may herald the onset of hæmorrhage. (3) The judicious administration of calcium salts in order to shorten the coagulation period of the blood and improve the tone of the C N S was of the utmost importance. Yet it could be—unconsciously—overdone. In South Africa of 3,000 cases there were 1100 of thrombosis from excessive calcium in the frozen milk used. Yet calcium—properly used—is of great value. Subcutis tendinum may perhaps be associated with calcium deficiency. Calcium tends to convert the mucinogen of the intestinal wall into mucus—and to thus protect it. Mist Cretæ and Cretæ preparati are suitable forms of calcium for administration. (4) Iron—in the form of Tinct Ferri Perchloridi—was a sheet anchor in treatment. It was nonsense to say that it upsets the digestion. Doses of half a drachm four times a day, up to two drachms in the 24 hours could be easily tolerated. A series of 250 cases treated with this drug had shown an average increase of 40 per cent in H B value in 19 days. Under iron treatment tympanites disappears, the tone of the heart muscle improves and the sulphur products in the intestine are neutralized.

With regard to tympanites it was to be noted that there might be invasion of the peritoneum without actual perforation and secondary septicæmia is the result of tissue lysis followed by invasion of the blood stream by septic cocci. Iron is the best of intestinal antiseptics and reduces the number of cocci present. (5) With regard to diet proteins—and especially animal proteins—should be withheld to diminish the virulence of the activities of the coccal group. (6) Heart failure was an always threatening complication and when the pulse reaches over 140 death frequently results. For sudden heart failure intravenous strophanthin was the best remedy. But digitalis should be given in all cases and given early from the third day of disease onwards. It protects the ventricles from the auricular impulses by blocking the bundle and when once digitalis has taken charge of the bundle the toxins fail to affect it whereas if the toxins are allowed to act on the bundle no amount of digitalis will be of effect. The doses of digitalis ordinarily prescribed are quite useless. Whatever text-books may say there is not the least evidence that digitalis after therapeutic doses cumulates in the system. It should be given early and given in full therapeutic doses.

With regard to relapses, out of 180 such cases, no less than 72 had given cultures of septic cocci from the blood. In concluding Colonel Barnardo said that everything in the text-book on enteric was out-of-date. There was scarcely any disease so very amenable to proper treatment and drugs and the chapter on the enteric fevers needed re-writing.

In a discussion on Colonel Barnardo's paper Dr Sunil Kumar Bose said that the cocci isolated from the blood were probably accidental. He considered Colonel Barnardo's views on the action of digitalis not merely revolutionary but inaccurate. Major H W Acton M.S. said that what was wrong with pathological reports was not the laboratory's findings but the clinician's misuse and misunderstanding of them. Further, typhoid was not infrequently associated with

other diseases such as malaria, which thus altered the clinical picture. He wished to say something about those 17,000 cases from Mesopotamia he had seen many of them at Amara and had conducted laboratory examinations upon a large number of them. They were not typhoid at all—which was relatively rare—they were almost all Paratyphoid A, an entirely different disease, not usually attended with hæmorrhage or perforation, and amenable to any or no line of treatment. Typhoid was a disease, the clinical picture of which had been given by Colonel Barnardo. Para A was a milder type of septicæmia. Para B was an enteritis with but little septicæmia element. Streptococcal infection was usually associated, not with tissue lysis as in the typhoid ulcer, but with infiltration. Dr Tarak Nath Sur begged for publication of Colonel Barnardo's paper, as it would assuredly repay careful study and arouse discussion. Major R Knowles, I.M.S., as Secretary thanked Colonel Barnardo for the endless trouble and pains taken over his extremely interesting paper, and also hoped that he would see his way to publishing it, as it would be certain to arouse interest and claim attention. Its statistical basis was enormous. There was one point, however. He was not a pharmacologist and spoke subject to correction, but he was amazed to hear Colonel Barnardo deny the cumulative action of digitalis—he had always understood it to be one of the most clearly proved experimental findings in pharmacology. At the same time recent work had shewn that Colonel Barnardo's claim was right that ordinary doses have little therapeutic action, and that the usually accepted dosage is far too low.

Dr Satya Saran Mitter mentioned that the ancient Ayurvedic writings drew attention to rose spots between the four corners of the anterior abdominal wall. Cases with early bed-sores often meant involvement of the spinal cord. The tonsils could not be neglected as a channel of invasion. He had also frequently observed the rise of temperature before hæmorrhage.

Dr Brajaballav Saha drew attention to hyperpyrexia from lesions of the corpus striatum, and to tympanites due to intestinal atony. Dr Bramachari mentioned the uselessness of digitalis in the rapid heart of fevers. The value of iron as an antiseptic was not so overwhelmingly evident. True such fevers as diphtheria and influenza were often rendered far more severe by secondary streptococcal invasions—but was there any sudden leucocytosis or other suggestive finding to support Colonel Barnardo's view that hæmorrhage and perforation and the septicæmic state were mainly due to streptococci?

ANNUAL REPORTS.

PLAGUE IN INDIA

From the Annual Report by the Public Health Commissioner, Government of India, 1920

THE following extracts from the Government memorandum and the Public Health Commissioner's remarks in connection with plague will be of interest to our readers—

"The present juncture is favourable for the initiation of a more extensive campaign against the disease. Owing to the character of the seasons to the gradual conferment of partial immunity from the disease upon the rat population of certain centres and possibly to a change in the virulence of the causative organism, there has recently been evidence indicating a decline in the epidemicity of plague. In 1918-19 the mortality sank to less than one-sixth of the mean mortality from this disease during the past twenty years. In the year now current (1921), though there are indications that the disease is again increasing the mortality up to and including January was far below the average. Plague constitutes a notable example of seasonal dis-

ease, its intensity being at the lowest ebb in July, gradually increasing till it reaches its zenith in March and rapidly declining during the next four months. It is axiomatic that in every epidemic disease with marked seasonal prevalence the first and most obvious line of attack lies in reducing the number of foci of infection during the period of minimum intensity, i.e., during the non-epidemic season. The opportunity thus annually offered for the extermination of bubonic plague is rendered all the more favourable now by the fact that the disease appears to be passing through a period of low epidemicity.

The Advisory Committee created in 1905 and its workers established beyond doubt the radical causes of bubonic plague. These are now well-known and it is unnecessary to allude to them here except only in so far as they bear on the practical problem of extermination. The disease is essentially a rat disease. The rat responsible for its maintenance is the black domestic rat, or *Mus rattus*. This is the only species of rat which lives in intimate association with man. The black rat does not migrate to any distance. When the infection is present and the rat-population is sufficiently numerous to maintain an epidemic, an epizootic (or precedent outbreak of disease among animals) takes place. If the rat-population is sparse this epidemic either cannot arise or is of short duration. But attempts to reduce the rat-population are useless unless carried out continuously and on a large scale, since prolific breeding quickly compensates for the results of any save organised destruction. The epizootic among rats is followed after an interval of not more than seventeen days by the outbreak of human plague. The infection is transmitted from rat to rat and from rat to man by the rat-flea. The plague-infected flea may live, apart from the rat-host, and remain infective for a period of twenty-three days, or, in low temperatures, even longer. In a hot dry climate, at a temperature above 80 degrees Fahrenheit, the infected flea speedily dies—the probable cause of the cessation of plague at the onset of the hot season. But in certain districts of India the climatic conditions are such, that, given a sufficiency of black rats to maintain the infection the disease may persist throughout those months which in other parts of the country are non-epidemic. Moreover, in any part of India, plague may persist among rats through the non-epidemic season without revealing its presence by unusual sickness or mortality among them.

The measures taken in India to cope with plague and its outbreaks fall under the following heads—

- (i) Hospitals for the treatment of the sick
- (ii) Evacuation of infected areas
- (iii) Anti-plague vaccination
- (iv) Rat-destruction
- (v) The erection of rat-proof grain stores

These measures fall into two groups, according as they are intended to deal with existing outbreaks among men, or to go to the root causes and, by attacking the foci of disease, to stamp out the disease itself.

The erection of infectious diseases hospitals outside the large cities has been limited in the past by various circumstances—inadequate funds, the scattered nature of the population and the strong dislike of entering a hospital which is evinced by large numbers of the people. The evacuation of infected areas has in the past been the most popular of plague measures. To village-folk, accustomed to an out-door life and with their fields around them it offers little hardship and is often resorted to spontaneously and with good results. In cities it is more difficult when enforced it has sometimes met with serious opposition and requires careful organisation and control. Voluntary evacuation of cities when uncontrolled has too often taken the form of a stampede which carries the disease to other and uninfected areas. Anti-plague vaccination is gaining in popularity but the number of persons annually inoculated is small in comparison with those exposed to infection, and the immunity

conferred probably does not continue from one plague season to another

These measures, then, useful as they are, have not been carried out under perfect conditions, nor with that degree of organisation and that wide extension of application which would safeguard the people at large from the effects of an already existing epidemic. Nevertheless, they have proved of benefit and, if more fully organised, are capable of still more satisfactory results. Until effective steps have been taken to eradicate the disease at its bases, it is necessary to persevere in them. The institution of infectious diseases hospitals, organised preparation of camps for evacuation of infected quarters, the multiplication of rural dispensaries and a great increase in rural areas of the number of medical practitioners capable of performing inoculation—these are the measures which it is incumbent on provincial and local authorities to continue so long as India is exposed to the epidemic and until the disease can be finally extirpated. Above all, propaganda-work is essential, in order that knowledge may be disseminated regarding the nature of the disease and the value of proper treatment, of evacuation of infected places and of inoculation.

But these measures, beneficial as they are and more beneficial as they may become if more fully organised and extended, form only palliatives and, even if carried to their highest perfection, are incapable of striking at the roots of the trouble. They constitute a useful line of defence against an attack already in progress. But reliance upon merely defensive tactics is futile in the contest against a disease whose causes and the sources of whose supply will remain unimpaired by the prosecution of these measures. The treatment hitherto adopted is the minimising of human plague. The true enemies are the rat and the rat-flea. The black rat is the primal cause and the host which carries the seeds of infection. It is only through offensive measures against the rat that a successful issue can be expected.

Such an attack does not necessarily or even most desirably proceed solely by way of rat-destruction. The separation of man from the rat is equally effective and in some centres may prove more suitable. This is evidenced by the history of plague in Europe. As late as the seventeenth century the houses of European cities were habitually overcrowded, small and dark. The towns were largely inhabited by a farmer population. Cattle were kept in the town-dwellings. Grain was stored in the houses. The black rat, who is a dainty feeder, consequently found ample food in and about human dwellings and took up his abode in close domestic association with man. The result was the creation of foci of infection and violent epidemics of plague. Improvements in housing conditions, measures of sanitation and the storage of grain in appointed places rendered the haunts of men a less comfortable home for the black rat. The close domestic association of this animal with man was thus broken and, as an inevitable result, bubonic plague disappeared from Europe. Up to the middle of the eighteenth century the predominating rat species in Europe was the black rat (*Rattus*), now the commonest is the brown rat (*Rattus norvegicus*), which is never found in such close association with man. With the departure of the black rat from the houses of men and the consequent diminution of the species, the epidemic naturally died.

Thus, good housing and sanitation are the surest means of extirpating plague. In recent years town improvement schemes have been initiated in India and experts have drawn up plans and specifications for houses which can be erected at reasonable cost and will afford no comfortable habitation for the rat. Such measures however involve long periods of time for their completion and are dependent upon the provision of funds and the extent to which the population at large are prepared to accept them.

Pending such general improvement, the next best solution of the problem consists in the protection of grain from the rat by means of better storage. This is a measure of the highest importance and, the Government of India believe, is not impracticable. But the provision of improved grain stores also will be a lengthy process, and meantime the destruction of the rat presents a means of protection deserving of consideration. It is to these two matters that the Government of India now desire to draw special attention.

Experiments have already been made with rat-destruction in the Punjab and at Satara. An investigation into the results is proceeding in Bombay. The Indian Research Fund Association has turned its attention to the problem and Major F. G. Kunhardt and Dr G. D. Chitre were employed to make a series of experiments.

The difficulties attending rat-destruction are as follows—

(i) In order to be effective, the operations must be organised and on a large scale. Ill-organised or inadequate attempts are worse than useless.

(ii) The best means of destruction have yet to be devised.

(iii) Unless the process is continued from year to year, it is useless.

(iv) Among some communities the destruction of the rat is regarded with aversion.

These difficulties are serious and the cost entailed in organised measures is considerable. But rat-destruction, as shown in the succeeding paragraph, cannot be overlooked, since it forms a valuable factor in the campaign against disease and in the efforts after national well-being. So fully is this realised in the United Kingdom that recent legislation has made it incumbent upon owners and occupiers of land in the British Isles at risk of substantial penalties to take all necessary and reasonably practicable steps for the destruction of rats and mice and against infestation of the land by these animals. Full-time experienced executive officers have been appointed to this end by many local bodies and by some industrial concerns.

On economic considerations alone, the universal adoption of measures for rat-destruction is highly desirable. It is hazardous to make any computation of the damage caused by rats in India. But it is probable that in British India alone the number of black rats (exclusive of other species) is about 375 millions, the quantity of grain devoured by which in the course of a year would amount to about one million tons. On this computation, and placing the cost of a ton of grain on the average at Rs 160, the annual loss caused by the black rat in British India would be sixteen crores of rupees, or, at a two shilling rate of exchange, sixteen millions sterling. That this is a conservative figure is shown by the estimate, based on far more reliable data, for England, where a rat-population of only forty millions is computed to cause material damage of fifteen millions sterling annually. The Indian calculation deals only with the loss represented by the food of the black rat, not with loss from the wastage and other forms of destruction (to houses, etc.) for which he is responsible, nor with the additional damage perpetrated by the field rat. But the economic aspect of rat-destruction is entirely overshadowed in India by the health aspect. The diseases, especially plague, which the rat brings in his train, occasion a loss of efficiency and a wastage of adult life which not only seriously hampers development but causes an immeasurable amount of pain and preventable affliction. During the last twenty years plague has been responsible for an average of half a million deaths in each year. The black rat is the originator and source of this disease. Even in countries which are not liable to plague epidemics he has been recognised as the most expensive of domestic animals. Where plague exists, such an expression falls altogether short of an adequate description of the loss which he inflicts.

His extermination will assuredly be followed by a complete cessation of bubonic plague, a substantial diminution in his numbers by a lessening in the extent and virulence of epidemics.

The Government of India therefore maintain that, save in localities where it is strongly opposed by popular sentiment, rat-destruction forms, under present conditions, a necessary factor towards the elimination of plague. It is not necessary to institute (at least for health purposes) a universal campaign against the black rat. Apart from those portions of India where the rat flea population is insufficiently large to create and maintain an epizootic, there are large areas where the extermination of the rat, though advantageous from the economic point of view, would be needless and ineffective for the stamping out of plague. Rat-destruction can be usefully carried out on the following principles—

(i) Continuous measures are necessary in grain-centres to which grain is imported from a distance.

(ii) In years when there is a likelihood of the importation of infection, measures are necessary in subsidiary grain-centres and market-towns.

(iii) In villages and towns (especially those which are market-centres) where infection persists during the non-epidemic season, measures are necessary during that season and also during the subsequent plague season.

In all these cases the measures taken must be well organised in order to be effective. Special and experienced staff is necessary. In the larger grain-centres, where continuous destruction is desirable, the number of rats annually destroyed should be sufficient to keep down the rat-population below the danger level, i.e., below the point at which an epizootic is probable.

The second method which it is desirable under present conditions to prosecute is the isolation of the black rat from man, i.e., his elimination from human dwelling places. In his admirable report on plague, Major Norman White, lately Sanitary Commissioner with the Government of India, specified two main lines of action—the improvement of markets and of the grain stores of towns and the control of movements of grain and like merchandise from and through plague-infected centres.

The improvement of grain-stores is manifestly free from some of the difficulties which rat-destruction involves. Religious scruples are not touched, though some opposition is inevitable to any action which disturbs domestic habits, the better storage of grain is so obviously indicated both from the sanitary and from the economic point of view that hostility would soon be converted into appreciation. If the natural food of the rat is not to be found in the homes of men, he will desert those homes. Similarly, if grain-stores are maintained in a city, but are so organised as to be unapproachable by, or useless to, the rat, his number will diminish and the probability of an epizootic will be decreased. The methods which can be adopted are therefore twofold.

(i) Markets and grain-stores can be removed from inhabited areas. The result will be that the rat can no longer live in contiguity with man, and if the stores are so constructed as to be rat-free the number of rats will be so much diminished as to make an epizootic among them unlikely.

(ii) Rat-proof or rat-free stores may be constructed in a city. The rat-proof godown is one which the rat is unable to enter. It presents difficulties in construction and involves considerable expense. The rat-free godown is one which the rat can enter but where he cannot remain. It is easily built. Major Norman White has made a design which can be carried out at reasonable cost. Apart from some details of construction the essentials are the exclusion of those things which (as well as grain) are requisite to the well-being and life of the rat—water and green food, and also the exclusion from its proximity of any rooms occupied by man. In addition

to Major Norman White's plan, a standard plan has been published by the Madras Sanitary Board. Godowns on the former design are being constructed at Lucknow and at Nasik. Railway Companies have been requested to take steps against rat-infestation of goods-sheds and the access of rats to wagons.

The task of improving grain-storage at the large distributing centres alone is one of magnitude and of time. But no measure is of greater importance for the extirpation of bubonic plague and other diseases, quite apart from economic reasons.

The control of grain-movements would, if feasible, be of great value. For the black rat does not migrate from place to place and plague can be disseminated over the country only by the conveyance of an infected rat or flea in merchandise or clothing. The rat-population is densest at grain-centres and it is just to such centres that the infection is most likely to be carried. But economic considerations weigh heavily against the adoption of such control. A possible alternative is the erection at the larger distributing centres of plants for the disinfection of grain by hydrocyanic acid.

The causes of plague and the methods which may be adopted for its elimination have now been surveyed. Investigations have shown that an epidemic of human plague is invariably preceded by an epizootic among black rats. The black rat is not migratory save when living in proximity to man; he is therefore harmless as an infective agent. A reduced rat-population, even if it remains in proximity to man, is incapable of maintaining a serious epizootic. While therefore the palliatives hitherto adopted—hospital treatment, evacuation of stricken areas and anti-plague vaccination—must be sedulously maintained and the facilities for extending them increased, it has to be recognised that these are mere palliatives, that the initial responsibility for the outbreak and spread of bubonic plague rests on the black rat, and that the destruction or segregation of this animal is the obvious and only method which will exterminate bubonic plague. Since any measures which involve construction of buildings and considerable initial outlay must necessarily take time, it is necessary in the meantime to depend on rat-destruction carried out continuously in large grain-distributing centres and as required in villages and towns. But the erection of rat-proof or rat-free grain-stores resulting in the diminution of the rat-population is a method just as effective and free from the objections which might possibly be held to attach to rat-destruction.

Major Norman White's review of twenty years of plague in India shows that Madras, Burma and Rajputana were the latest provinces to become plague infected. Plague made its appearance in Burma in 1905 and it was not until 1918 that Rajputana was severely attacked. It is noteworthy that these provinces are those where plague shows least signs of dying out. During the current year (1920) Mysore, Central Madras, and Lower Burma were the only centres where plague persisted throughout the off season. These are areas where humidity remains constant throughout the year. As Major Norman White pointed out humidity is an important factor in influencing persistence of plague.

The following experimental and research work on plague was carried out in 1920.

1. Extensive deratization operations costing 1½ lakhs were carried out in two selected areas, Belgaum and Dharwar in the Bombay Presidency under the direction of Dr Strickland. It had previously been proved that local deratizations can appreciably reduce plague and these experiments were undertaken with a view to obtaining cumulative and therefore better results by the deratization of contiguous local areas.

The total number of rats destroyed was close on a million and the cost worked out at Re. 1 per 35 rats killed. The work was carried out in 15 grain centres and in 30 places specially marked down as likely to carry over plague during the off-season by means of chronic rat infection. (A note on Dr Strickland's

report appears elsewhere in this number of the Gazette) An experiment such as this needs carrying on for several years and owing to the natural vagaries of plague incidence it is very hard to test the result by means of controls

2 Research work at the Special Plague Laboratory, Poona established the fact that the most satisfactory rat poison is barium carbonate which should be 80 per cent pure and free from repellants Baits made up with the grain *bajra* are the most attractive The tainting of traps by the human hand reduces efficiency by 21 per cent The 'Zip' and 'Wonder' traps are recommended

A paper by Major F W Cragg published in the *Indian Journal of Medical Research* (Volume IX No 2, 1921) proves that there are three species of the rat-flea viz *Xenopsylla cheopis*, *X. astia* and *X. brasiliensis* Of these only *X. cheopis* appears to be an efficient transmitter of plague as there is a close correlation between the preponderance of this species and the prevalence of plague Further research on this point will probably clear up the very remarkable immunity from plague enjoyed by Bengal and Assam"

Reviews.

THE ORIGIN AND EVOLUTION OF THE HUMAN DENTITION—By Professor William K Gregory, Ph D Published by the Williams and Wilkins Co, Baltimore for the Journal of Dental Research, Inc New York Page 548

THIS book includes a good index and a useful list of references to important literature. There are 353 photographs and diagrams which are exceedingly instructive The book is well bound and the printing and paper excellent.

The volume is divided into five parts and the purpose of the book is to give a brief and concise review of the origin and evolution of the human dentition from the palæontological view point. Considering that as the author points out, there are so many debated subjects requiring detailed discussion it must be admitted that he has achieved his object although it takes 548 pages

The author has adopted a helpful plan in giving a summary and his conclusions at the end of each part and also a final summary of the review as a whole. By reading through these in the first place one gains a preliminary idea of the extent of the work.

One can recommend this book to all keen students of comparative dental anatomy, and it should find a place as a book of reference in all libraries of medical and dental works

HISTORY OF THE GREAT WAR BASED ON OFFICIAL DOCUMENTS DISEASES OF THE WAR VOL I—Edited by Sir W G MacPherson, Sir W. P. Herringham, Colonel T R Elliott and Lt-Colonel A Ballour, H M Stationery Office 550 pp 21/- net (Obtainable from Messrs Thacker, Spink & Co, Calcutta and from all Agents for Government Publications, India)

OFFICIAL books are apt to provide dull reading This volume, however, is something entirely different, and probably constitutes the most important contribution to medical literature yet made during the current century It should be in the hands of every medical practitioner in India Compiled from an immense statistical basis written section by section by a galaxy of the most brilliant of British physicians from their

war experiences and official records, exceptionally clear and concise, illustrated by six beautiful coloured plates it is of exceptional and outstanding interest. No medical officer who served during the war will read this volume without recalling problems and difficulties which he experienced, without finding new information based upon unimpeachable authority, and of immediate practical value in his professional duties When a nation in arms goes to war in many different areas and under climatic conditions which embrace every possible variation from the snows of Northern Russia to the torrid deserts of Mesopotamia, the collated and collected resultant information with regard to war diseases is bound to be of interest

Chapter 1 deals with the general aspects of disease during the war In the S African War (31 months) the ratio per 1,000 of admissions from sickness to admissions from wounds was as 843 34 in the Russo-Japanese war (18 months) it was as 590 392 in the Great war it depended upon the theatre of war concerned In France, 1918, the relative figures were 980 980 574 803 admissions in Macedonia for 1917-1918 they were 331,753 12,552 admissions Of the principal diseases enteric was nowhere over 10 admissions per 1,000 of strength except in Egypt and Mesopotamia in 1916-1917 whilst malaria was the cardinal problem in Macedonia E Africa and Egypt Of the epidemic diseases of former wars, dysentery malaria enteric, small-pox and typhus—the last two were practically absent among British troops, whilst the enteric incidence was much smaller than in any previous war No single disease, except malaria, caused as much proportional sickness among the troops as did beriberi among the Japanese in the Russo-Japanese war If malaria in Macedonia was a far more prevalent cause of admissions than wounds, of the only available collection of figures from France no less than 25 per cent of sickness was found to be due to simple skin lesions, scabies, pruritis of some type or other, and preventable by personal cleanliness Whilst, in general the standard of sanitary discipline was excellent in such matters as water supply and conservancy the immense effect of uncleanness in the production of disease must be recognised in future far more than it has been hitherto And as a second general lesson of the war comes this—"The immense services which original research can render to preserve the efficiency of an army The examples of trench fever, of cerebro-spinal fever, of gas poisoning, and of gas gangrene shew what wonderful results can be obtained by the union of clinical and pathological research not only at home, but also in the actual area of operations"

Chapter 2 on the enteric fevers is by Major J A Torrens Here the statistical basis is of very great value The incidence per 1,000 varied from 0.12 for France 1918, to 17.25 for Egypt, 1916 The case mortality shews a marked rise after 1916 (Western Front) both for inoculated and non-inoculated the result of the strain of war years The mortality table for the different types is of great importance, 10 per cent. in typhoid 26 per cent in Para A, 15 per cent in Para B The writer emphasises the fact that, whilst Paras A and B are far less dangerous fevers than is typhoid, yet either may give cases with every one of the more severe symptoms of true typhoid The relative death-rates for inoculated and non-inoculated shew surprising variations

Chapter 3 on the dysenteries is by Major P H Manson-Bahr and shews the vastly greater importance of bacillary, as against amoebic dysentery in war At least 90 per cent of the acute clinical dysentery in the Eastern war theatres was of bacillary origin Admission rates from bacillary dysentery varied from 7,900 per 100,000 ration strength in Mesopotamia in 1916 to 126 and even lower figures for France In a particularly good account of the morbid anatomy of bacillary dysentery the author draws special attention to mucus-retention cysts as a sequel and *B. coli* septicæmia following on

intestinal ulceration. In 1915 in France dysentery was only responsible for an average stay of 42 days in hospital but as the war dragged on and the stamina of the troops became reduced dysentery became a very serious cause of invalidity, the figure reaching an average stay in hospital of 250 days in Salonika in 1917-1918. The use of sera and vaccines is discussed, but, as the author admits, the present day treatment of bacillary dysentery is very unsatisfactory. Amœbic dysentery especially affected the Indian troops and especially the Eastern theatres of war. The wonderful war work of Dobell, Wenyon and O'Connor—work which has cleared up the whole of the confused and muddled entamœbic literature of the previous 40 years—is summarised and the uses and abuses of emetine well discussed.

Cholera is dealt with by Colonel O. L. Robinson. Two thousand eight hundred and fifty-two cases occurred among British troops in Mesopotamia, the infection having reached the Lahore Division from "Cholera creek" which flowed through the Turkish lines and which had become contaminated. The history of "P. 50" shews that cooking places in river steamers should not be placed aft of latrines. The mortality varied from 34 to 41 per cent in Mesopotamia, and was regrettably high. The author confesses himself unable to fully assess the value or otherwise of anti-cholera inoculation.

A short but useful resume of the war work on typhus by Colonel W. Hunter, who was in charge of the Sanitary Mission to Serbia, 1915, is next followed by a splendid chapter on cerebro-spinal fever by Colonel M. G. Foster and Lt.-Colonel M. H. Gordon. This chapter is excellent; it summarises for the reader the exceedingly important research, bacteriological and preventive work on the disease during the war years—work which is otherwise only accessible in many different, scattered journals. It is illustrated by beautiful colour plates of the skin eruptions. As everywhere throughout the book, mass statistical information is given of great value. During the epidemic of 1914-1918 the case mortality among troops, 45 per cent, was definitely lower than that in the civilian population, 66 per cent. The authors insist on the necessity for early lumbar puncture in suspected cases, without waiting for the development of the clinical picture. The final M.R.C. serum gave remarkable results: of 141 cases treated with it before the 7th day of disease only 27 proved fatal, 19 per cent. A most interesting chart shews that the carrier rate is directly proportional to the distance between beds in barracks, 30 per cent or more when the beds are within nine inches of one another, under 2 per cent where they are separated by three feet.

Sir Wilmot Herringham and Lt.-Colonel H. French write on Influenza again a valuable summary of recent work, almost inaccessible elsewhere. A most striking colour plate shews the usual type of flushed facies, the heliotrope cyanosis with little physical distress but almost hopeless prognosis, and the invariably rapidly fatal facies of pallor with blueness of the lips and ears. A colour plate of the whole lung in a case of influenzal pneumonia, and four microphotographs shew the morbid anatomy of influenza almost better than could any text. In France as elsewhere, a two-wave and even a three-wave incidence was well shewn: an early mild epidemic in June-August 1918, followed by the severe type epidemic in October 1918-March 1919. The numbers affected were enormous, more even than the official figures shew, as many cases never went to hospital. 112,274 admissions with 5,483 deaths in five months. The official chart (in another volume of the series) shews that this period, November 1918, corresponded with the maximal rise of hospital accommodation in the United Kingdom, when there were 320,000 beds occupied out of the total available of 360,000 in military and voluntary aid hospitals. Instances are quoted of an artillery brigade losing a third of its strength from influenza in 48 hours, and of

an ammunition column with only 15 out of 145 men fit for duty.

A section on symptomatology, which differentiates between the disease as seen in the home hospitals and as seen in the field, and is fully illustrated with temperature charts is followed by an able review of the our present day knowledge—or rather ignorance—of the causative organism and by a full account of the morbid anatomy shewing especially how influenza lowers the powers of resistance and paves the way for almost epidemic secondary invasions of the lungs. Essentially the broncho-pneumonia is of interstitial type. Symptomatic treatment is given in detail, the value or otherwise of vaccines discussed, and attention drawn to the very great importance of open air treatment. The chapter on influenza is followed by one by Sir J. Rose Bradford, and Lt.-Colonel H. French on purulent bronchitis and broncho-pneumonia. Here the writers clearly differentiate epidemic, purulent bronchitis from ordinary catarrhal bronchitis. The former disease occurred in two epidemic waves in the winters of 1914 and 1916, quite apart from and before the influenza pandemic. It was particularly severe among the Indian troops in Flanders in 1914-1915. The bacteriological findings were almost always Pfeiffer's bacillus in association with the pneumococcus. The disease is one with a clear cut clinical picture: a characteristic profuse sputum which is uniformly homogeneous and purulent, tachycardia, dyspnoea and cyanosis, few physical signs in the examination of the chest, a fall of temperature by either crisis or lysis, and a special tendency to death after the temperature has returned to normal.

Chapters 9 and 10 on Malaria are by Colonel C. M. Wenyon and Major Manson-Bahr, with a table of malarial mosquitoes of the war theatres by Captain Waterston. Malaria was in all probability the most important disease of the war: the figures for 1916-1918 shew total malarial admissions of 160,000 in Macedonia, 35,000 in Egypt, 107,000 in sixteen months in E. Africa, and 20,000 in Mesopotamia. The number of men attacked in the British and Indian armies by malaria in the field during the war must have exceeded half a million, and Macedonia and E. Africa stand out with notorious reputations. So prevalent was malaria in Macedonia that, during the influenza epidemic, out of over 100 autopsies held on influenza cases 83 per cent shewed malarial pigment in the spleen. The British Army arrived at Salonika at the end of 1915 after the malaria season was well over and it was not until the advance to the Struma and the Vardar, June-October 1916, that the epidemic set in. The two most important anopheline carriers were *A. maculipennis* in the valleys and *A. superpictus* in the hills. The different seasonal incidence of B.T. and of M.T. parasites is well brought out: the malarial season sets in in Macedonia with a B.T. wave—many of the cases being relapses—later the curve for M.T. cases rises and reaches its maximum two to three months later. The quartan parasite was found in native children in the Strumica valley, but was exceptionally rare among the British cases. In Palestine the important anopheline carriers were the same with the addition of *A. bifurcatus*, a well mosquito. Cilicia was the worst district occupied. In E. Africa *A. costalis* and *A. funestus* were the two important carriers, and malaria was responsible for 57 per cent of the admissions to hospital. The nature of the campaign rendered anti-malarial operations almost impossible, and it is recorded that the troops actually destroyed much of the mosquito screening of occupied German houses in order to obtain better ventilation. In Mesopotamia the most intensely malarious area was that between Basra and Kurna, and the chief carriers *A. stephensi* and *A. sinensis*.

Turning to symptomatology and treatment a good general clinical account of types is given, and the fact emphasised that splenomegaly is not a necessary accompaniment even of relapsing and chronic malaria. The modes of quinine administration are fully discussed,

together with quinine poisoning and the thorny question of quinine prophylaxis. Lt-Colonel H B Newham contributes a short and concise chapter on blackwater fever as seen during the war. Chapter 12, on sleeping sickness, is also by the same author. There were 20 cases among British troops in E. Africa and one in the Cameroons. Dr Andrew Balfour deals with relapsing fevers. Two types were concerned in the war areas, the relapsing fever of Europe, Palestine, Egypt, Persia and Mesopotamia where lice, and in Persia possibly *Argas persicus* were the vectors and the African type, transmitted by *Ornithodoros moubata*. The agglutination test with immune sera and Coles' method of examining stained films with the dark ground apparatus deserve mention. An analysis of 1,500 E. African cases by Manson and Thornton is of considerable interest. An ordinary case shows about 10,000 spirochaetes per c.mm of blood but in fulminating cases the spirochaetes may equal the RBCs in number. A pseudo pneumonia is not uncommon. Whilst the salvarsan derivatives and salvarsanized serum are the cardinal drugs of therapeutic value they sometimes fail if administered later than during the first pyrexial rise. The same author also deals with sandfly fever and this chapter is especially well written with due weight being given to the question of whether it is or is not identical with dengue. Of 2,000 cases analysed the average stay in hospital was twelve days. Lysis is usual but the fever may end by crisis, whilst a second pyrexial rise is unusual. Opium is the drug par excellence for this fever. Camp sites in the tropics should be selected away from rocky outcrops in a sandy soil.

Chapter 16 on trench fever is by Sir W Herringham and Lt-Colonel W Byam and summarises information of great value. The disease was not officially recognised until 1917 and was only made notifiable in 1918. The estimated incidence was at least 45 per 1,000 per annum in France. The whole of the war work on lice and *Rickettsia* bodies is here summarised in readable form. The fever is of considerable importance "the average of definitely known disability lasting for over six months cannot be reduced to less than 37 per cent. of the chronic cases" and at least 5 per cent of D.A.H. cases must be attributed to this disease.

Lord Dawson of Penn and Col W Hunter write on jaundice as seen in the war. Here there is an excellent account of the different causes of this symptom followed by a clinical account of Weil's disease illustrated with temperature charts, a series of microphotographs of the morbid anatomy of the disease in various organs and a beautiful colour plate of the lung in spirochaetal jaundice. The guinea-pig test is the one for immediate use on suspicion of the disease. Epidemic catarrhal jaundice was prevalent during the Gallipoli campaign, and appeared to show some correlation to bacillary dysentery infections, whilst duodenal cultures in some instances yielded *B. facalis alkaligenes*. In the enteric fevers as seen in the Dardanelles and in Mesopotamia jaundice was a prominent symptom, as many as 5 per cent. of cases shewing it. Brule's work on jaundice in general as being due to hepatitis rather than to mechanical obstruction of the ducts receives attention.

Sir W H Wilcox writes on scurvy and beri-beri. The former disease was most rife among the Indian troops in Mesopotamia in 1916. 11,455 admissions in six months the causes being the ration scale in force for Indians, their system of rationing in their peace stations prior to proceeding on service before 1917, and the nature of the operations and the country. New ration scales for Indian troops were introduced in July 1916, two ozs of fresh fruit being added, with fresh vegetables, meat and tamarind as extras. In October 1916 the ration was again improved, and once Baghdad had been entered the local supplies improved. The official lime-juice proved itself of very uncertain value. Beri-beri was prominent among British troops besieged in Kut whilst outbreaks occurred at Shaiba

in 1916 and elsewhere in Mesopotamia in the same year. The Chinese labour corps also shewed the disease. Again improvements in ration scales soon stopped the spread of the disease. Marmite, a yeast preparation proved very useful. Symptomatology and treatment of both diseases are fully dealt with. Famine dropsy is described by Col J A Nixon, consulting physician to the Rhine Army. It was essentially a disease prevalent among British prisoners of war in Germany. The German ration for such cases was very poor in protein and practically fat free. It was given almost entirely in the form of soup to which much salt was added, and the men drank water freely. A full account of symptomatology, diagnosis, and treatment follows. The chapter on Pellagra is by Brev-Col P S Lelcan. This disease occurred chiefly among the prisoners of war in Egypt, of whom 8.5 per cent of those captured were affected. The distribution evidence clearly shews that the disease is not infectious. A study of the dietary tables shews that the one dietetic factor which can be incriminated is a biological deficiency in proteins. The Turkish ration being exceedingly deficient in this, a figure of 30 as against figures of 93 and 55 for British and Indian rations.

Nephritis is dealt with by Sir J Rose Bradford, who does not regard war nephritis as a distinct and separate clinical entity. The condition was prevalent in 1915 in France, and to a less extent in 1916 and 1917. Case incidence per 100,000 of strength varied from 21 to 104, the winter months shewing the chief incidence. Two factors seem essentially concerned in every case, first the presence of chronic renal disease and second the occurrence of some acute infection prior to the onset of nephritis. The army on active service is estimated to have contained at least 11 per cent of men with inefficient kidneys. A curious feature brought out by the figures is that Indian troops in France, although suffering severely from cold and much affected with respiratory diseases did not contract trench nephritis. Symptomatology is fully detailed. Mortality was very low, about 1 per cent, but the disease was important in causing prolonged stay in hospital and invaliding. Haematuria may occur.

The final chapter is one on Cardio-Vascular disorders by Lt-Colonel W E Hume. The importance of "V.D.H." and "D.A.H." in auto-suggestion to the soldier is well shewn. "Effort syndrome" is a better term and one which does not inspire the patient with a dread lest he be suffering from heart disease. It also usually represents the actual state of affairs. Of war pensioners it is estimated that one in every ten suffered from cardio-vascular disorder. Up to May 1918, 36,569 men had been discharged from the army and navy under this head. Yet of every 1,000 cases reported only 55 could be shewn to be suffering from valvular disease. The influence of the C.N.S. on the pulse rate is well shewn in a series of observations on post-typoid tachycardia where it was found that if the patient fell asleep whilst the polygraph was recording, the pulse rate immediately halved. Rheumatic fever, trench fever and phosgene gas all contributed cases of organic cardiac disease. In addition to special hospitals and staff at home it was found that the opening of special cardiac centres in France saved much time spent in hospitals by patients and contributed materially to returning men to duty at an early period.

Throughout the whole of this very valuable book and in each section carefully selected and full bibliographies for the different diseases concerned cover the years from 1914-1920 and constitute a ready made card index. The index to the volume is full and very easy for reference. This volume, which is the first of two to be devoted to medical diseases of the war is not merely a military medical manual. It is a full, authoritative, up-to-date and invaluable summary of the more important diseases met with in tropical medical practice in the light of present day knowledge.

Correspondence.

ANTIMONY-FAST KALA-AZAR

To the Editor of THE INDIAN MEDICAL GAZETTE

SIR,—During the past two years about a hundred cases of kala-azar have come under my personal observation. Out of these, five cases either showed parasites in spleen films or spleen juice and gave positive cultures after a full course of antimony treatment, *i.e.*, 2 to 25 gms of potassium or sodium antimony tartrate distributed over a period of 3 months as recommended by Major Knowles, I.M.S., although they gained weight (one patient gained as much as 31½ lbs), the spleen became smaller, fever stopped and the blood condition improved, (?) convalescent carriers. One other case did not respond to antimony at all. Notes on this case were published in the September 1922 number of the *Indian Medical Record*.

Again, a week ago Dr Bhattacharyj showed me a similar case, a child of 4 years who had been treated by a doctor of large kala-azar experience. The patient had had 54 injections amounting to more than 15 gms of antimony. There being no amelioration of the symptoms, the diagnosis of kala-azar was doubted and on Dr Bhattacharyj's suggestion spleen puncture was carried out. Small torpedo-shaped parasites were found in the stained smears and a positive culture was obtained in Dr Napier's acidulated N.N.N. and Row's media on the 3rd day.

I request that readers of your journal who have had experience of treating similar antimony-fast cases will kindly publish their opinion on the management of these cases—Yours, etc

B M GUPTA,

Asst Professor of Protozoology

CAICUTTA SCHOOL OF TROPICAL MEDICINE

15th November 1922

CATARACT VERSUS EXPRESSION

To the Editor of THE INDIAN MEDICAL GAZETTE

SIR,—Major Wright's letter in your issue of October 1922 would call for no reply from me were it not that he entirely misrepresents me. He does not adduce a single fact of his own observation though in possession of a first class clinic, and can only lead your readers to the conclusion that he knows nothing personally about intracapsular extraction and hence he needs no reply on the merits.

He represents me as going to America to popularize intracapsular extraction in that country and as having been "allowed to operate." I went to America on a large number of very pressing invitations on condition that I would not operate after my experience in Bombay at the time of the Bombay Congress. When I arrived the demand was so pressing that I consented to operate I made no conditions. Clinics were got together varying from 16 to 78 cataracts, in all close on six hundred cases. The selections I made just as I would do in Amritsar and Jullundur. As regards reporting the cases I left that to the good taste of the surgeons in charge of the cases and it speaks volumes for American good taste when only one paper has appeared in the American press—I presume that one is what Major Wright refers to—and it was certainly not as bad as the famous Bombay cases. There were a few cases reported at a local meeting in another place and when followed up by another surgeon about a month ago were shown to have been really good instead of the reverse.

I ask Major Wright or any other surgeon would he do a lot of cases not seeing them after they left the operating table to the charge of others as regards after treatment and reporting, running the risk of the reporter being hostile and stake his reputation on such? I doubt if he would. One thing Major Wright can accuse me of and that is in having been courageous in doing as I did and that I do not regret it. The result convinces me that taken all round there is not a finer or more sportsmanlike lot

of surgeons in the world than in America. They played the game. The cases were done *sine condicione*. The American surgeons treated it as a demonstration in a subject in which they were keenly interested and not as test cases—Yours, etc

HENRY SMITH, C.I.E.
Lieut-Col I.M.S., (retired)

SIDCUP KENT,
31st October 1922

Service Notes.

INDIAN MEDICAL SERVICE

The New Director-General

THE term of office of the present Director-General of the Indian Medical Service, Major-General Sir William Edwards, K.C.I.E., expires in January 1923. As his successor, has been appointed Colonel Robert Charles Macwatt, C.I.E., the senior colonel on the establishment. Colonel Macwatt was born on January 22nd, 1865, the son of Dr Robert Charles Macwatt, of Dunse, Berwickshire, so will be 58 when he takes up his new post. He was educated at Edinburgh University, where he graduated M.B. and Ch.M. in 1886 and B.Sc. in 1897, subsequently taking the F.R.C.S. (Eng.), in 1911. He entered the I.M.S. as Surgeon on October 1st, 1887, became Major after twelve and Lieutenant-Colonel after twenty years' service and attained the rank of Colonel on January 8th, 1918, when he was appointed Inspector-General of Civil Hospitals in the Punjab, the post which he still holds. Almost all his service has been spent in the political department in Rajputana, under the Indian Foreign Office, where he has held the posts of Agency Surgeon successively in Haraoti and Tonk, Kotah, and Jhallawar. In June 1907, he became Residency Surgeon of the Western Rajputana States, and in November 1913, of the Eastern Rajputana States, while in September 1914, he was appointed Chief Medical Officer in Rajputana and Civil Surgeon of Ajmir. He served on the North-west Frontier of India in the Hazara campaign of 1888, receiving the frontier medal with a clasp, in the Lushai campaign of 1889 on the North-east Frontier (clasp) and again on the North-west Frontier in the Hazara and second Miranzai campaigns of 1891, getting a clasp for each. He received the Kaisar-i-Hind medal of the first class on January 1st, 1908, and the C.I.E. on January 1st, 1916 and on March 22nd 1921, was appointed Honorary Surgeon to the King.

OBITUARY

LIEUTENANT-COLONEL PATRICK MURPHY, Bombay Medical Service (retired), was killed in the sack of Smyrna by the Turks on September 13th, aged 78. He was educated at Queen's College, Cork, and graduated M.D. and M.Ch. at the Queen's University, Ireland, in 1868. He entered the I.M.S. as Assistant Surgeon on October 1st 1869 became Surgeon Lieutenant-Colonel after twenty years service and retired on January 17th, 1895. He served in the Egyptian war of 1882, when he was present at the battle of Tel-el-Kebir and received the medal with a clasp and the Khedive's bronze star.

APPOINTMENTS AND TRANSFERS

LIEUTENANT-COLONEL P. DEE M.B. I.M.S. is appointed to be Inspector-General Civil Hospitals Burma, with effect from the 27th September 1922.

LIEUTENANT-COLONEL A. W. R. COCHRAN M.B. F.R.C.S. I.M.S. Officiating Inspector-General of Civil Hospitals, United Provinces is confirmed in that appointment, with effect from the 9th November 1922.

CAPTAIN H. S. ANAND I.M.S. is appointed to be a probationer in the Chemical Examiners' Department, and is attached to the Chemical Analysis Laboratory at Bombay.

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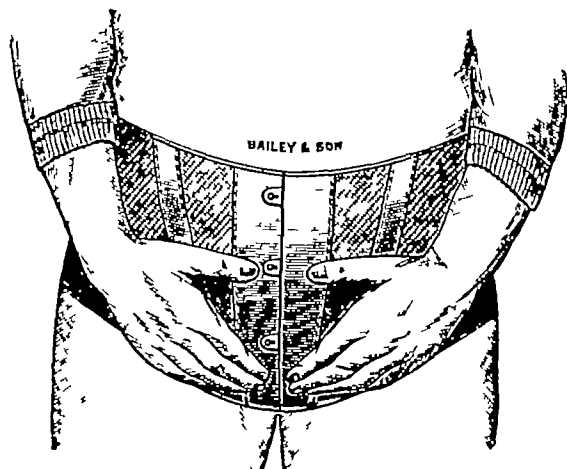
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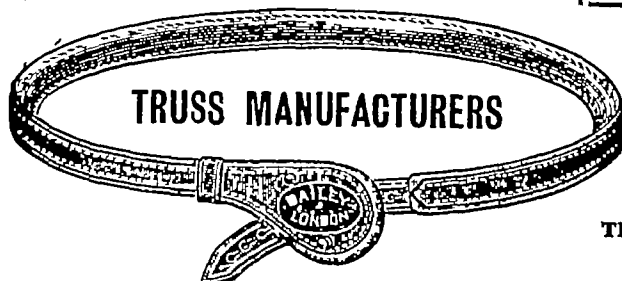


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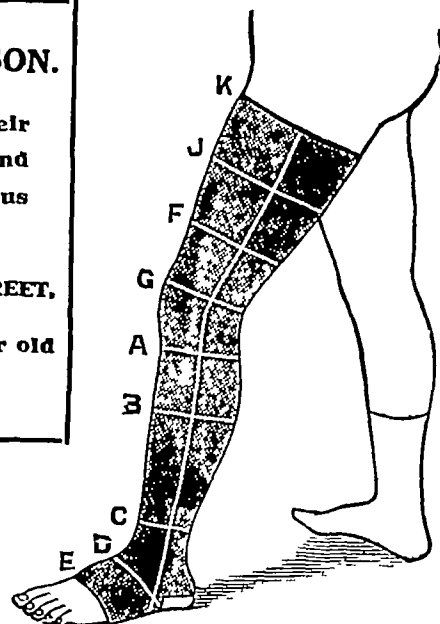
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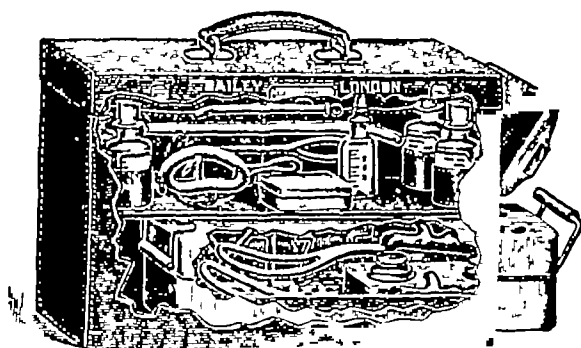
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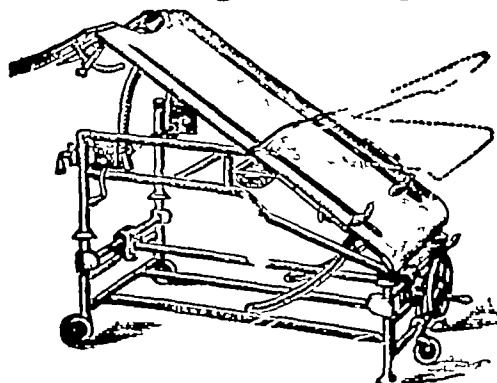
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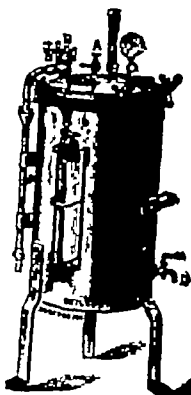
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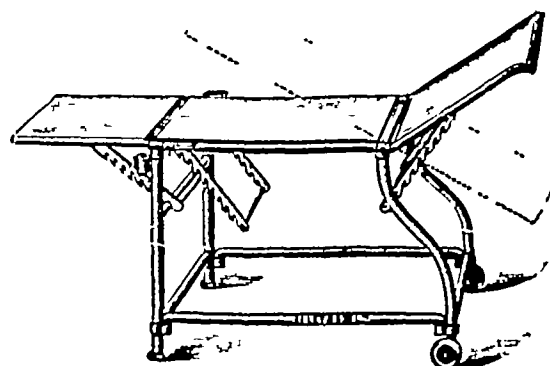
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LONDON, W.1.

MAJOR E. C. HODGSON, DSO I MS, Officiating Assistant Director-General, Indian Medical Service (Sanitary), is appointed to officiate, in addition to his own duties, as Public Health Commissioner with the Government of India, during the absence on deputation of Lieutenant-Colonel F. H. G. Hutchinson, CIE D I I MS, with effect from the 28th October 1922

MAJOR H. E. STANGER LEATHES I MS assumed charge of the duties of Chief Medical Officer, Delhi, in addition to his own duties as Health Officer, Imperial City, with effect from the afternoon of the 12th August 1922, relieving Lieutenant-Colonel J. Norman Walker, I MS proceeding on leave

In anticipation of his services being placed at the disposal of the Chief Commissioner Lieutenant-Colonel W. W. Jeudwine, C MG MD I MS assumed charge of the duties of Chief Medical Officer, Delhi, with effect from the forenoon of the 25th September 1922, relieving Major H. E. Stanger Leathes, I MS, of the additional charge.

The services of Captain H. K. Rowntree, MC, MB I MS Deputy Assistant Director-General, Indian Medical Service, are placed temporarily at the disposal of the Government of Bihar and Orissa, with effect from the date on which he assumes charge of his duties

MAJOR A. W. Truter, I MD made over charge of the duties of Superintendent of the Central Jail at Multan to Lieutenant-Colonel J. H. Murray, CIE I MS, on the forenoon of the 28th August 1922

RAI BAHADUR LALA UMRAO RAJA LAL, Civil Surgeon made over charge of the duties of Superintendent of the District Jail at Ferozepore to Lieutenant-Colonel J. G. G. Swan, CIE, BA MB I MS on the afternoon of the 27th September 1922

LIEUTENANT-COLONEL J. H. MURRAY, CIE, MD I MS made over charge of the duties of Superintendent of the Central Jail at Multan to Major M. D. Wadia I MS on the forenoon of the 25th September 1922

LIEUTENANT-COLONEL W. W. JEUDWINE, C MG I MS made over charge of the duties of Superintendent of the District Jail at Jullundur to Khan Sahib Muhammad Sharif, I MS Civil Surgeon, on the forenoon of the 20th September 1922

MAJOR W. D. H. STEVENSON, CIE I MS is appointed Officiating Director, Pasteur Institute of India, Kasauli, with effect from the date on which he assumes charge of his duties

MAJOR J. L. SEN MC, MB I MS whose services have been placed by the Government of India at the disposal of the Government of Assam is appointed temporarily to be Civil Surgeon, Naga Hills, with effect from the 13th July 1922

The services of Major F. J. Kolapore, I MS have been replaced at the disposal of His Excellency the Commander-in-Chief in India with effect from the 2nd May 1922

CAPTAIN U. J. BOURKE, I MS is appointed to be the Superintendent of the Buxar Central Jail, with effect from the date on which he assumed charge of his duties

MAJOR W. J. POWELL MB BCH DPH I MS is posted as Superintendent, Central Jail, Jubbulpore, vice Major R. T. Rodgers, MBE, proceeding on leave

On relief by Lieut.-Col. W. H. Kenrick, LRCP FRCS DTM I MS Major J. M. A. Macmillan, MA MD CHB FRCS LRCP I MS Civil Surgeon, Jubbulpore, is transferred in the same capacity to Hoshangabad

His Excellency the Governor in Council is pleased to appoint Major J. M. A. Macmillan, MA, MD, CHB FRCS LRCP, I MS Civil Surgeon, Hoshangabad, to the executive and medical charge of the District Jail, Hoshangabad

The services of Major W. L. Forsyth, MB, I MS are placed temporarily at the disposal of the Government of the Punjab with effect from the date on which he assumes charge

CAPTAIN J. M. SHAH MBE, I MS is appointed to be Deputy Assistant Director-General, Indian Medical Service, with effect from the 16th October 1922 vice Captain H. K. Rowntree, MC I MS

The services of Captain J. P. Huban, OBE MB I MS are placed temporarily at the disposal of the Chief Commissioner of Delhi, with effect from the date on which he assumes charge

MAJOR B. GAIE I MS, Military Medical Officer, to be Civil Medical Officer of Roorkee in addition to his own duties vice Major W. E. R. Williams, I MS with effect from the afternoon of the 30th September, 1922

PROMOTIONS

The undermentioned temporary Lieutenants, who have subsequently been granted permanent commissions, to be temporary Captains, subject to His Majesty's approval, with effect from the dates noted against their names —

Satyendra Nath Mukerji, FRCS E. Dated 20th November 1915

Mohamed Moosa Khan and Hira Singh Anand Dated 26th November 1915

Ian Dingwall Grant (Resigned) Dated 5th December 1915

Ambuj Nath Bose Dated 8th December 1915

Sundar Das Sondhi, MC MB Dated 20th July 1916

Rustam Merwan Kharegat, MB Dated 11th September 1916

Jelal Mochool Shah, MBE Dated 17th December 1916

LEAVE

LIEUTENANT-COLONEL F. H. WATLING, I MS, Superintendent, Central Jail, Buxar, has been granted by the Secretary of State an extension of leave for one year, six months and twenty days on half average pay, with effect from the 11th October 1922

RETIREMENT

SUBJECT to His Majesty's approval, Colonel Henry Francis Cleveland, CIE, has been permitted by the Right Honble the Secretary of State for India to retire from the service with effect from the 25th October 1922

RESIGNATION AND RETENTION OF RANK

CAPTAIN GOPALKRISHNA RAMRAO PABDIRI is permitted subject to His Majesty's approval, to resign his temporary commission, with effect from the 15th September 1922

CAPTAIN MAHARAJA KRISHNA KAPUR is permitted, subject to His Majesty's approval, to resign his honorary temporary commission, with effect from the 16th January 1922, and to retain the honorary rank of Captain

WITH reference to Army Department Notification No. 228, dated the 4th February 1921, the undermentioned officer is permitted to retain the rank of Captain —

Amrita Christopher Shanta

The undermentioned officer is permitted to retain the rank of Captain —

Atmajyoti Sen

CAPTAIN HARENDRA NATH BOSE is permitted, subject to His Majesty's approval, to resign his temporary commission, with effect from the 19th September 1922, and to retain the rank of Captain

CAPTAIN NORMAN HUBART SMITH, MB, is permitted, subject to His Majesty's approval, to resign the service with effect from the 15th October 1922

NEWS OF THE WOMEN'S MEDICAL SERVICE FOR INDIA

Communicated by Dr M I Balfour, CMO, IVMS

THE following have been appointed to the Women's Medical Service for India and have been posted as follows —

Miss Ruby Carr, M B, Ch B, Resident Medical Officer, Dufferin Hospital, Calcutta

Miss Georgina Davidson, M B, Ch B, Personal Assistant to the Chief Medical Officer, Women's Medical Service

Miss Mary Murphy, M B, Ch B, Assistant to the Professor of Pathology, Lady Hardinge Medical College

Miss G Mahomed Ali, M B, has gone on relief to Shegaon, and Miss B Thungamma, FRCSE, has gone on relief to Rawalpindi

Mrs Wemyss Grant, M D, on the conclusion of 2 years' work as Organising Secretary, Lady Chelmsford All-India League for Maternity and Child Welfare, has resigned her appointment, and the post of Hon Secretary, Lady Chelmsford League has been taken up by Miss M I Balfour, Chief Medical Officer, Women's Medical Service

The Lady Hardinge Medical College opened for the new term on September 16th with 18 students in the first year and a total of 92 students. The first students will be sent up for the final examination for the M B, B S, Punjab University, in May next. The staff has been increased during the past year by the appointment of Miss J Hamilton MacIlroy, M D, DPH, as Lecturer on Ophthalmology

The Countess of Dufferin's Fund has for some time had under consideration the question of the improvement of the salaries of the women assistant surgeons employed in the Junior Branch of the Women's Medical Service. Unfortunately the Council receives no Government aid for this purpose and the funds at its disposal are small. Moreover it is felt that it is the duty of Provincial Governments, now that medicine is a transferred subject to arrange for its own women assistant surgeons. Accordingly it has been decided to sanction a personal allowance of Rs 100 pm or Rs 50 pm according to qualifications to each woman assistant surgeon in the employment of the Council, as a temporary measure and to address the Local Governments and ask that they should admit women to their Provincial Medical Services on the same terms as men graduates

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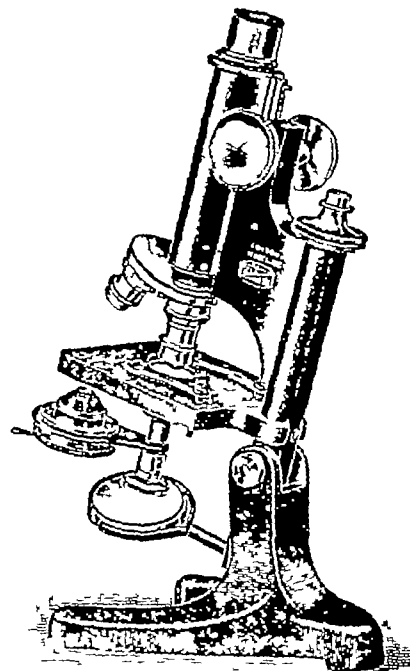
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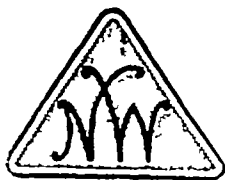
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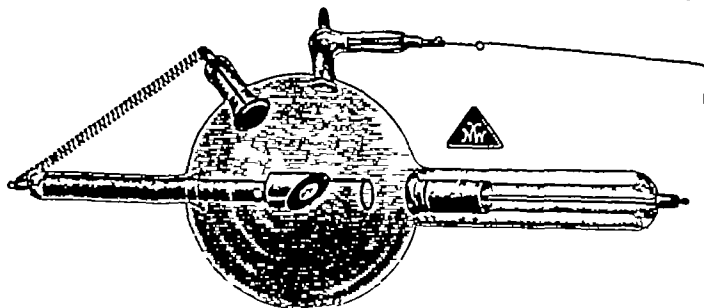
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Original Articles.

TWO FAMILY OUTBREAKS OF THE EPIDEMIC DROPSY TYPE OF BERI-BERI

PART I

By J W D MEGAW,

LIEUT COL. I M S,

*Professor of Tropical Medicine and Director of the
Calcutta School of Tropical Medicine and Hygiene,*
and

R. N. BANERJI, M B, B SC.,

Allahabad

THE first of the outbreaks which will be described briefly in this paper occurred during 1919-20 and my reason for not recording it earlier is that my old pupil Dr R N Banerji, who made a close study of the cases intended to publish a detailed report, and it is only because he has not been able to find time to do so that this short note is written.

The blood examinations, blood-pressure determinations and most of the other observations were made by Dr Banerji, who is associated with me in writing the first part of this paper. In January 1920, Dr Pramanick asked me to see four patients from Allahabad whom he thought to be suffering from beri-beri. The patients were members of a highly cultured and well-to-do Bengali family consisting of thirteen members belonging to three generations, the ages varied from 8 to 80. With the exception of one who lived ordinarily in Lucknow, all the family occupied a large house in Allahabad, and all but one of them had definite symptoms of epidemic dropsy. The first cases began to occur early in November 1919, and by the beginning of January 1920 twelve members of the family had been affected to a greater or less extent, the victims being attacked one by one at varying intervals.

The most striking manifestations of the disease were —

(1) Gastro-intestinal symptoms which occurred in ten out of twelve. There was diarrhoea in eight and dysentery in one. There was tenderness in the epigastric region, in three cases followed by considerable vomiting. There was slight nausea or vomiting in seven others.

(2) There was swelling of the feet and legs of varying severity and duration in all the cases.

(3) Fever of an irregular type occurred in eight cases. The temperature was seldom higher than 101°F and in the milder cases the fever was slight and of brief duration.

(4) A systolic bruit, best heard over the pulmonary area was detected in ten of the cases, and in four of these there were definite signs of dilatation of the heart accompanied by dyspnoea,

There was reduplication of the pulmonary second sound in two cases.

(5) The knee jerks were exaggerated in ten cases, and were entirely lost in two of the cases on the day when I saw them. There was tenderness of the calf muscles in three cases in one of these it was very pronounced and this case ended fatally. In one case the gait was like that of locomotor ataxy.

(6) A striking feature of the disease was a tendency to hæmorrhages of which the following were noted —

- (a) Petechial skin hæmorrhages in three
- (b) Bleeding piles in two
- (c) Epistaxis in four
- (d) Hæmatemesis in three
- (e) Hæmoptysis in three
- (f) Hæmorrhagic retinitis in four

The occurrence of hæmorrhagic retinitis was one of the most remarkable features of the outbreak. This was detected by Lt-Col Lister, I M S, who was called in to examine the eyes of some of the patients whose sight was seriously impaired. It is interesting that Lt-Col Lister quite independently formed the opinion that the retinitis was of toxic origin, a view which I had already formed on other grounds.

In one case which ended fatally there was almost complete blindness before death in the others gradual complete recovery of sight followed. Some of the other features were that the coagulation time was 3½ to 4½ minutes in the cases examined by Dr Banerji. The systolic blood-pressure in three severe cases was 125, 140 and 155 mm. It was not tested in the others but there was no suggestion of any pronounced change in the blood-pressure.

The hæmoglobin in the severest cases was reduced to 34 per cent and 40 per cent respectively. The total and differential leucocyte counts were well within normal limits. Albumin was found in the urine in small amount in only one case. The general course of some of the cases was as follows —

The most severe case was that of a previously healthy young man, aged 27, who was the first to be attacked. His first symptom was diarrhoea, and as there was nothing to indicate the nature of the disease he was ordered a diet exclusively of rice by the doctor who was called in. He steadily grew worse and was in a very critical condition when seen by me towards the end of January. He had great swelling of the whole of the body, severe dyspnoea, orthopnoea and palpitation. There was evidence of considerable dilatation of the heart, chiefly affecting the right side. He made a slight response to treatment which consisted of light diet (chiefly fresh milk), salines, injections of digitalin and absolute rest, but as nearly always happens in cases which have progressed so far, he eventually died of heart-failure after a total illness of 3½ months. It is worth noting that injections of pituitrin and adrenalin gave him temporary partial relief.

Another very severe case was that of a young lady, aged 24, who also had been put on a strict rice diet early in November for diarrhoea. Her sight was greatly impaired and it is likely that she also had retinal hæmorrhages. She had severe dyspnoea and generalised œdema. She responded partially to treatment, relapsed, was taken to Lucknow and there improved, but unfortunately contracted the prevailing influenza and died after about three-and-a-half months' illness.

The only other fatal case was that of an old lady of 80, who had symptoms which compelled her to take to bed for a fortnight. In spite of the strongest persuasion of her doctors she insisted on getting up and helping to look after the others who were ill, and a few days later, when apparently quite convalescent, she suddenly died of heart-failure.

The remaining cases of varying degrees of severity responded very well to treatment, which consisted in cutting off rice, feeding them on a diet rich in fresh animal proteins like fresh milk, eggs and meat. Fresh fruit juices were also ordered. Salines were given whilst the intestinal symptoms and the swelling lasted, and complete rest in bed was insisted on.

In a few weeks all these patients were in their usual health.

One case deserves special notice. The member of the family who lived in Lucknow went to visit his sick relatives and within ten days of his arrival in Allahabad he began to suffer from swelling of the feet and legs, with diarrhoea and weakness. He returned to Lucknow where he made an uneventful recovery. There can be little doubt that he became subjected to the same conditions which brought about the disease in the other members of the family, that these conditions caused his illness, and that when he was withdrawn from them the disease disappeared.

The conditions of life of the family were as follows —

They lived in the manner usual to Bengalis in a good position. The house was large and well ventilated. The diet was

- 1 Breakfast—chiefly rice
- 2 Midday meal—cereals and vegetables
- 3 Evening meal—chiefly wheaten bread

In addition to the above basic diet, meat was taken once a week, fish twice a week and fresh milk daily by most of the members of the family. The rice was a specially fine quality of old country (non-polished) rice which had been bought in bulk five months before the outbreak and had been stored in bags kept on a wooden platform in a well-built masonry room on the ground floor. The room when seen in January was dry, but like most store rooms it was dark and not ventilated. The rice was believed to be two years old before it was purchased. The wheat was of the best quality and was stored under the same conditions as the rice. The mustard oil was also of the best, it had already been

analysed for the presence of arsenic which was suspected. There was still a large quantity of rice left over when the outbreak occurred. This was taken to the Lucknow Medical College and was given to a number of fowls and to three monkeys in the Pathology Department as their exclusive diet. The fowls developed polyneuritis in the usual way, but the monkeys apart from some loss of weight remained healthy for several weeks whilst I was able to keep up the experiment. Only a little of the stock of mustard oil remained, this was given to a monkey and no symptoms of any kind followed.

The wheat could not be tested as very little of it was left. The feeding experiments thus yielded entirely negative results. Some salient features of the outbreak were —

There was no history of importation of the disease from outside, and no previous history of dysentery or diarrhoea. There were no other known cases of the disease in Allahabad at the time so the cause must have been one specially affecting the household. Two cases of beri-beri were known to have occurred in a Mahomedan family in Allahabad six months previously, but these had no connection with this outbreak. The servants who had their meals outside were not attacked though they were in close and constant contact with the patients. There was one exception, a *chuprasi* employed by the family who was not supposed to eat any of the family food supply, but though he denied having done so, it is quite possible that he had found some means of getting a share of the family food.

Every member of the family except one old gentleman was affected within a short space of time. With the exception of the old lady the severity of the disease appeared to be proportional to the amount of rice eaten. The early cases which were placed on strict rice diet were much more severely affected than others.

All the members of the family were total abstainers from alcohol.

PART II

By J W D MEGAW,

Another small outbreak in Allahabad

In April 1920 one of my students brought four members of his family to consult me on account of symptoms which he quite correctly attributed to beri-beri. These patients were also members of a well-to-do Bengali family of Allahabad. Their diet was wholesome and varied and appeared to contain abundance of all the essential vitamins. The cases were much less severe than the preceding, probably because the nature of the disease was recognised at an early stage and suitable treatment was adopted.

There was diarrhoea at the outset in three, the legs of all four were swollen, there was irregular fever in three at the outset, but this was very slight and would probably have escaped notice if it had not been looked for. The knee

jerks were absent in three out of the four when seen by me. There were no hæmorrhages in any case, and, whilst the illness was essentially the same as that described in Part I of this paper, it is obvious that the cause of the disease was acting in a much milder form.

The loss of the knee jerks in three out of the four is particularly interesting, as it serves to bridge the gap which existed between the other group and the classical form of beri-beri.

The rice was a fine quality of country rice grown in the United Provinces known as "Dilkhoosha Rice."

The cases were seen by me twice only but on the second occasion they had already responded to the prescribed treatment so satisfactorily that there was no longer the slightest ground for anxiety.

Discussion of the above outbreaks

In connection with these two outbreaks of epidemic dropsy in Allahabad certain questions arise.

I. Is the disease the same as beri-beri?

This point cannot be discussed within the limits of this short note, but the general consensus of opinion is that epidemic dropsy cannot be differentiated from beri-beri, and until further evidence is available it is better to classify the disease as a member of the beri-beri group.

This point will be the subject of a later communication and so will not be considered at this stage.

II. Can the disease be accounted for on the vitamine deficiency hypothesis?

There are several points strongly against this.

(a) The fact that the families affected were living on a diet which was much above the average in variety and in vitamine content.

(b) The fact that the diet had been just the same for years, without showing any evidence of being inadequate in any respect.

(c) The fact that other families living in the same place on a diet obviously less rich in vitamins were not affected.

(d) Most important of all is the fact that one of the victims became affected within a few days of arrival in the affected household, whereas disease due to vitamine deficiency takes a long time to develop.

III. Can the outbreak be explained as an infection?

Against this are the following points.

(i) There was no evidence whatever of any source of infection or of the disease having occurred amongst other families in the vicinity.

(ii) There was no tendency for the disease to spread to the servants who were in close attendance on the patients and who were exposed to same conditions in every other respect, except the matter of diet.

The only exception to this was the case of the *chuprasi* who was not so intimately associated with the family as the other servants, and though

for obvious reasons he could not be expected to admit having eaten the family food, it is quite possible that he may have done so.

(iii) All the cases which were brought under treatment before the disease reached too advanced a stage responded promptly to a treatment which was in no way directed towards controlling an infection.

(iv) In many similar outbreaks there has never been any satisfactory evidence of infection.

IV. Can the outbreaks be accounted for by food poisoning?

All the observations made are consistent with this theory especially.

(a) The occurrence of gastro-intestinal disturbance followed by symptoms suggestive of a general intoxication, such as hæmorrhagic retinitis, peripheral neuritis, cardiac and vasomotor disturbances, all these point very strongly to a poison entering by the mouth ready-made or developing in the upper alimentary tract.

(b) The symptoms were proportional to the amount of rice consumed, being most severe in the patients who had lived chiefly on rice during the early stages of the illness.

Points which raise a difficulty are the facts that the same kind of rice had been consumed for months without ill effect and that a sample of the remaining rice did not appear to produce any toxic effect on the animals fed on it.

A probable explanation of these circumstances is that the poison was produced by some accidental contamination of a part of the supply of rice. Some of the bags may have become infected with a micro-organism or may have been stored in such a position that an infecting organism found favourable conditions for its propagation.

There appears to be a *prima facie* case in favour of rice intoxication as a probable explanation of the outbreaks and I propose to discuss this question more fully at an early date.

Ever since the outbreak of epidemic dropsy in Calcutta, on which I published a note in the *Indian Medical Gazette* in April, 1910, I have become more and more convinced of the necessity for taking into account seriously the old view that epidemic dropsy and beri-beri may be caused by a poison generated in rice under certain conditions, and that the preparation and storage of rice should be investigated from this point of view as well as from the point of view of deficiency. Major Acton agrees with my view that the association between the high prices and prevalence of epidemic dropsy which was observed by Col Greig may not depend on the inferiority of the diet, but on the hoarding up of rice in anticipation of still higher prices and the consequent development of poisons in the rice. Such evidence as I had been able to collect is strongly in favour of this view, but conclusive proof is still lacking.

The Allahabad outbreaks seem to be worth recording as evidence in favour of a reconsideration of the causation of beri-beri.

THE SEASON OF ONSET OF KALA-AZAR

By T C McCOMBIE YOUNG, M.B., D.P.H.,
LIEUT-COLONEL, I.M.S.,
Director of Public Health, Assam

IN 1920 a serious recrudescence of kala-azar in those areas in Assam in which it was endemic, together with a tendency to an advance eastward into previously uninvaded country was observed, and measures to deal with this recrudescence were initiated by the Assam Government through the agency of its Public Health Department. In connection with this work, it was suggested to the writer by the Assistant Editor of the *Indian Medical Gazette*, Major R Knowles, I.M.S., that it should be possible to obtain from the large number of patients under observation sufficient data as to the time of first onset of their complaint to enable us to determine whether or not there is a definite kala-azar season in Assam.

In pursuance of this aim, a circular was issued to all the Sub-Assistant Surgeons in charge of kala-azar hospitals, dispensaries and treatment out-centres controlled by the Public Health Department, asking that the month in which the first onset of the disease occurred should be ascertained from at least 100 of the kala-azar patients under their care. Returns in regard to 5,011 such onsets have thus been obtained and an analysis of them is the object of this paper.

The credibility of these figures is naturally the first question which must be examined. This depends, in this instance, on the accuracy of the patient's statement of the time of onset and of the doctor's diagnosis of the complaint from which the patient is suffering. With regard to the first, some years' experience of village work in connection with kala-azar shows that the history which is given in nearly every case is that of a sharp initial attack of fever in some month or season which can be specified. The attack has usually been sufficiently acute to fix itself in the patient's memory as that of the commencement of his complaint and it is probable that the month to which he assigns it is approximately correct.

With regard to the accuracy of diagnosis, although there is undoubtedly some confusion with chronic malaria, one is inclined to think that the error is not large. The patients usually come under treatment not less than three to six months after the commencement of the illness, when the characteristic physical signs have convinced the patient's relatives that he is suffering from kala-azar, and not in the early stages when the resources of a hospital and a laboratory are required for a diagnosis. One has often been impressed with the accuracy of village diagnosis of this disease, which is one with which the Assamese are only too familiar, and, whilst a certain

amount of chronic malaria cases do undoubtedly present themselves for a treatment from which they, too, appear to receive benefit, one is inclined to think that the number of these is not large enough to vitiate the accuracy of so large a number of observations. Further, many of these observations are from hospitals and dispensaries where the diagnosis is verified by splenic puncture, and of late, in practically all cases, the aldehyde test has been performed as a guide to diagnosis. It will be observed, moreover, from a scrutiny of the returns of each separate centre, that the general district trend of them is the same, although each of them is the result of the work of observers acting independently and without bias towards any conclusion.

Another possible source of fallacy has to be considered. If there is any tendency for patients to appear for treatment some three to six months after the first onset, then other things being equal, a collection of onsets at any one time of year should result in a preponderance of onsets referred to a period some three to six months anterior to the date of enquiry. In considering this possible fallacy one notes as follows—

(1) These returns were for the most part collected during the same period, those for Darrang being collected in July, and the rest of the observations spread over August and September.

(2) Inasmuch as the course of treatment lasts some three months, if the records refer only to the statements of patients actually under treatment then the time of the appearance of the patients for treatment would have been spread over three months.

(3) As comparatively few of the centres would at any time have 100 patients under treatment, in order to complete the 100 observations desired in most cases, reference must have been made to the previous records of any histories of patients which are in most cases maintained.

(4) Further, as the number of observations, viz., 5,011, is about $\frac{1}{3}$ of the total number of patients treated last year and no large increase in the current year is anticipated, it does not appear probable that the observations under review refer to a set of patients who would necessarily have referred the date of onset to the same time because of a tendency to appear for treatment some three to six months after the date of onset.

(5) The difference between the Nowgong and Sibsagar figures and those for Sylhet, although the latter were collected only about a month later than the former, would not appear to be explainable by admission of the possible fallacy under consideration.

For these various reasons one feels that the figures are probably sufficiently reliable to be worthy of serious consideration.

THE SEASON OF ONSET OF KALA-AZAR.

By T C McCOMBIE YCUNG, M B, D P H,

LIEUTENANT-COLONEL, I M S

Director of Public Health, Assam

CHART I

Assam all districts

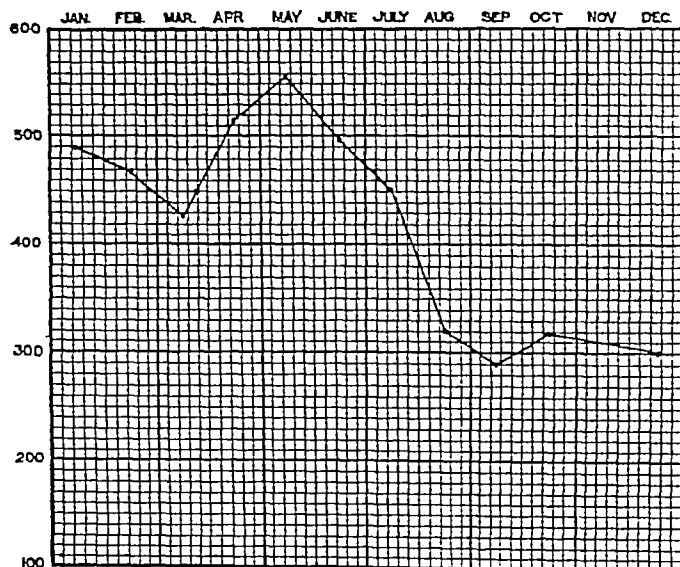


CHART IV

Kamrup

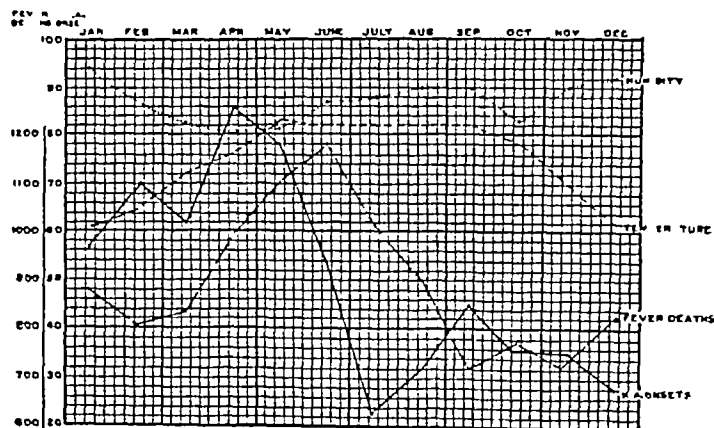


CHART II

Sibsagar

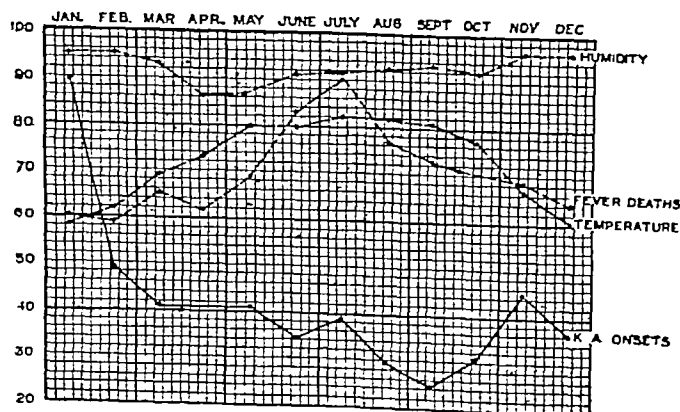


CHART V.

Darrang

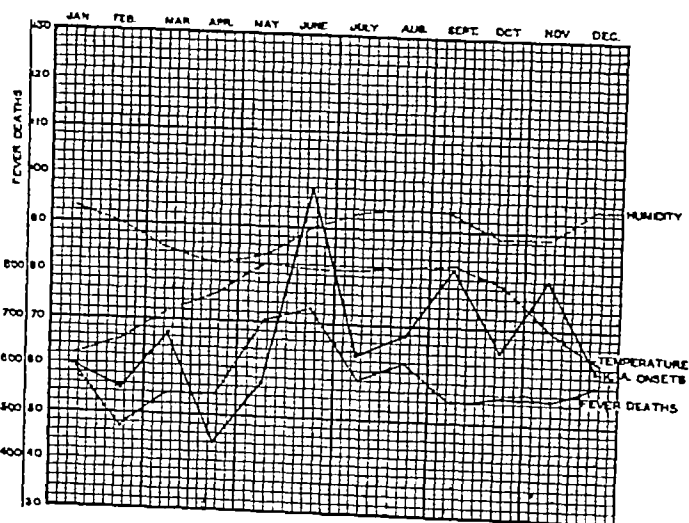


CHART III

Nowgong

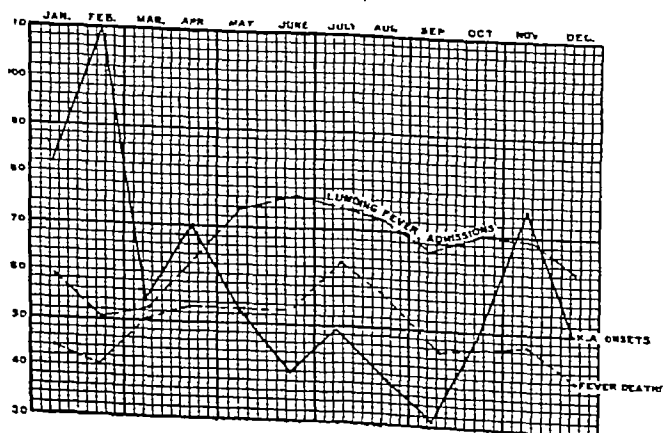


CHART VI

Goalpara

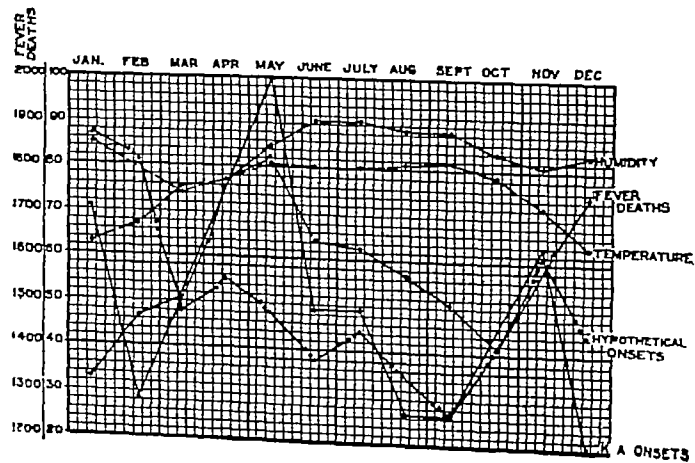
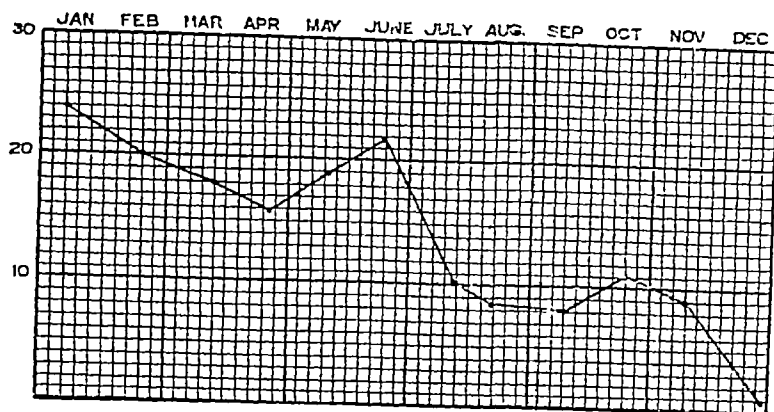


CHART VII.
N Cachar Hills



Garo Hills

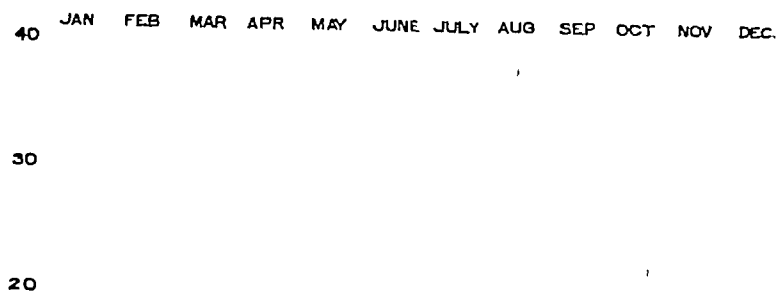


CHART VIII.
Sylhet.

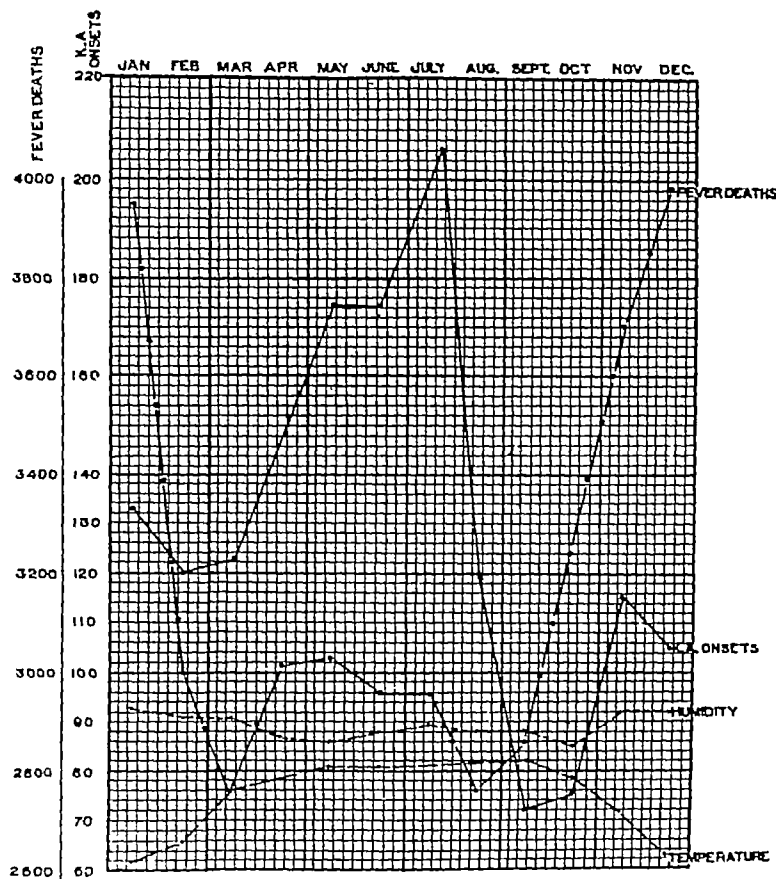
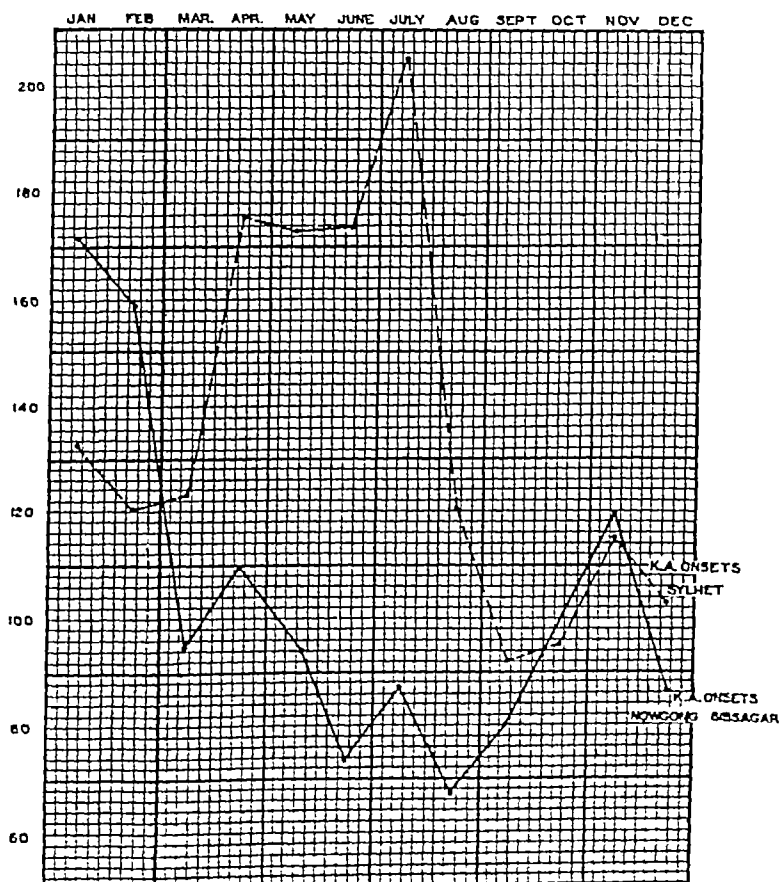


CHART IX

Different Seasonal incidence in Sylhet and Nowgong and Sibsagar



As no reliable evidence is available as to what is the incubation period of the disease these figures furnish no hint as to the probable time of infection, and they represent only the time at which the disease declared itself. From an experience of preventive work in the Upper Assam Valley one had come to look for a spring 'crop' of cases, whose first attack of fever had been in the cold weather. A curve showing the combined figures for the infected districts of the province does not however, fulfil the expectation of a preponderance of onsets during the cold season (*vide* Chart I). A fairly high level is maintained during January and February, it is true, but the curve rises to a maximum in May and coincides with the general wave of malarial incidence in the province. The trough of the wave occurs in September, and a secondary wave is noticeable in November, which fades off again in December.

It is not until one makes an analysis of the figures for each separate district, that a previously unsuspected characteristic reveals itself. Proceeding down the Assam Valley from the 'spreading margin' in Sibsagar to the endemic areas of the Lower Valley, one observes certain changes in the curves on the district charts. In Sibsagar (*vide* Chart II) the highest point is in January and the lowest point is in September, with a November rise, and no rise in the spring months. The Nowgong figures (*vide* Chart III) show a maximum in January and February, with an undulation upwards in April. The minimum is in September and there is a secondary wave in November. Of the returns submitted those from Sibsagar and Nowgong are probably the most reliable. The majority of the former are derived from a hospital in charge of an able and successful medical officer, Dr D C Bhaumick, assisted in out-patient work by a Sub-Assistant Surgeon of capacity and experience, and most of the diagnoses have been verified by splenic puncture. The figures from Nowgong, although perhaps clinically less accurate, are not less credible as relating to kala-azar. This district was, in the epidemic of the "Eighty's" and "Ninety's," the one in which the ravages of the disease were most severely felt, and it has ever since persisted there in a characteristic form. The people know only too well what kala-azar is and the probability is that allowing for all probable fallacies, the number of so-called kala-azar cases in Nowgong which are really suffering from some other disease is inappreciable.

In reviewing the figures for Sibsagar and Nowgong, therefore, the writer makes the assumption that those from Sibsagar and Nowgong are least affected by fallacies due to faulty diagnosis and that they may be accepted with some confidence as a true in-

dication of the time of onset of kala-azar in these districts.

As one proceeds down the Valley, the type changes, the cold weather maximum tends to disappear, or to be overtopped by a wave of incidence in the spring months.

In Kamrup (*vide* Chart IV), if the spring wave were flattened out, the type would be that of the upper districts, but in Goalpara (*vide* Chart VI) the cold weather incidence is at a minimum, with a maximum in the spring. The secondary undulation in November, and a trough about September or October is to be discovered here as in all the curves.

The Darrang curve (*vide* Chart V) which relates to the Mangaldai subdivision, shows a minimum of cold weather incidence and a maximum delayed until June.

The North Cachar figures (*vide* Chart VII) which are small but reliable with regard to diagnosis, being supplied from the kala-azar hospital at Maibong which is in charge of a reliable observer, show a January maximum, a spring wave, a minimum in September and a secondary undulation in October and November.

The Garo Hills curve (*vide* Chart VII) relating to a small number of observations show a general trend which is very similar to that for the adjoining district of Goalpara. The curve for the Sylhet district (*vide* Chart VIII) shows in a marked degree a wave of maximum incidence in the hot weather, April, May, June and July being the months of maximum incidence. The minimum is again in September and there are minor undulations in the five months preceding the rise in April.

In an attempt to throw some light on these unexpected variations of incidence, the following figures have been plotted out and added to the charts for comparison. First, "fever deaths" as shown by the broken line on the charts. One has to admit the impropriety of attempting to compare things that are not strictly comparable, for "fever deaths" are due to many causes other than malaria but it may be assumed that a maximum of "fever deaths" does indicate that a maximum of malarial fever onsets has occurred not very long before, and that therefore the curve of "fever deaths" gives some indication of the time of fever onsets, for comparison with the time of kala-azar onsets. The figures which have been added to the charts are the mean of the actual monthly "fever deaths" (excluding kala-azar) recorded in the districts concerned in the years 1917, 1918 and 1921, omitting the years 1919 and 1920 whose figures for the purpose of this comparison have been vitiated by the influenza epidemic. It will be seen that there is little similarity between the kala-azar and the fever curves in Sibsagar and Nowgong, whereas in Kamrup, Goalpara and

Darrang there is a great similarity in the upward and downward movements of both

In Sylhet the curves are completely divergent, the fever mortality in this district being at its maximum in November, December and January, when after cessation of the rains and the receding of flood waters, the pools and edges have formed which provide a favourable environment for the breeding of carrier mosquitoes

To the Nowgong chart has been added a curve based on figures showing the mean monthly attendance of malarial patients at the Railway dispensary, Lumding, in the Nowgong district, during the years 1910-11-12-13-14-15, which were obtained some years ago from the railway medical officer at Lumding before certain antimalarial measures were commenced there. This is probably the nearest thing to statistics of malarial onsets that the writer can at present obtain, and its divergence from the kala-azar onset curve, and its correspondence with the trend of the curve for the "fever deaths" adds some significance to the former, and credence to the latter as a general indication of the time of malarial onsets in Nowgong

In pondering on these figures and their significance, one next attempted to find some climatic factor which might explain them, and to the charts of those districts for which temperature and humidity figures are available, such information has been added. The temperature figures (hyphen line) are the monthly means of the mean between maximum and minimum, and the humidity figures (dotted line) are those for the monthly means of humidity at 8 hours. They relate to the year 1918, in which these mean figures are stated to be approximately normal, as returns for a later year or absolute averages are not at the moment available. From a scrutiny of these figures it would appear that the type characterised by a cold weather onset is associated with a mean temperature of about 60°F and a relative humidity of 94 per cent, whilst the hot weather type of onset appears to be associated with a mean temperature of about 80°F and a relative humidity of 85 per cent to 88 per cent

With regard to seasonal incidence Sir

Leonard Rogers has expressed the opinion that "there is a marked preponderance commencing in the cold weather," which he associates with the observation that "the extra-corporeal stage of the parasite only develops in culture below a temperature of 75°F" (*vide* "Fevers in the Tropics"). The figures for kala-azar onsets in Sibsagar would appear to agree with these views, but the figures for the type with a spring and hot weather onset as seen in the districts of the Lower Assam Valley and in Sylhet, are at variance with them

As the temperature and humidity figures appear to supply no explanatory link between the two different types and in view of the seasonal coincidence of the hot weather type of onset with that of malarial prevalence in the districts of the Lower Assam Valley, one is compelled to consider whether it can be possible that the bulk of the kala-azar of these districts is in fact malaria. Take for example, the district of Goalpara, which shows the spring incidence in a marked degree. From splenic punctures and general experience we know that kala-azar is undeniably present in the district. If it is being so much confused with malaria that the spring wave of malaria has masked it to the extent of producing an apparent spring incidence of kala-azar, what should be the true monthly incidence of kala-azar, of the Upper Valley type, in Goalpara district? In making an attempted estimate of this, one may perhaps assume that the incidence in any given month in Goalpara should bear the same relation to the minimum incidence in September, as the incidence of that month in Sibsagar and Nowgong combined bears to the minimum incidence in the month of September in these districts. This may be more precisely expressed as follows—If the consecutive letters A to L denote the kala-azar onsets in the months from January to December in Nowgong and Sibsagar, of which A represents January, B represents February and I September, and so forth, and if Y is the mortality in September in Goalpara, then $Y \times \frac{A}{I} =$ the estimated mortality in January in Goalpara, if the same type of kala-azar prevails in Goalpara as in Nowgong, and $Y \times \frac{B}{I} =$ the mortality in February and so on

	Jan	Feb	March	Apl	May	June	July	Aug	Sept	Oct	N v	Dec.
Siosagar	90	49	41	41	41	34	38	29	24	31	45	37
Nowgong	82	110	54	70	53	40	49	39	29	49	75	50
To als	172	159	95	111	94	74	87	68	53	80	120	87
	A	B	C	D	E	F	G	H	I	J	K	L

One has thus constructed a curve for Goalpara which one would assume to be the incidence of kala-azar onsets, if the cold weather type of kala-azar incidence were actually there, but masked by faulty diagnosis with malaria. This hypothetical curve shows that if about one-half to two-thirds of the cases diagnosed as kala-azar which attribute their onset to the spring months were in reality cases of malaria, the spring rise would be explicable, and this is a possibility which would have to be considered, were it not that this hypothesis would afford no explanation of why the number of cases in January in Goalpara is so small in comparison with what the "cold weather type" of onset should produce, for no error of diagnosis can explain away the absence of the onsets which the existence of the cold weather type would have produced if actually occurring.

Apparently then, if there is kala-azar in Goalpara (and we know that there is), it is of a type which has its main onset in the spring and not in the cold weather.

The Sylhet figures, which are large enough (1,583) to eliminate any serious statistical error, show quite clearly the Sylhet seasonal incidence of onsets to be entirely different from that of malaria.

From the evidence of these figures therefore it would appear that there are two different seasons of onset, one in the cold weather months, which prevails in Nowgong and Sibsagar, and another in the spring and hot weather months which prevails in the Lower Assam valley and Sylhet (*vide* Chart IX), in which the continuous line shows the monthly onsets in Nowgong and Sibsagar, and the dotted line the monthly onsets in Sylhet.

Curiously enough, this distribution of the different variety of onsets tallies with the distribution of what the writer has, for some years, come to recognise as somewhat different clinical types of the disease. The Sibsagar-Nowgong type is clinically more characteristic and probably more acute. Such a typical patient would be a child of 10 to 12 years old with wasted limbs, swollen feet and tumid abdomen, with an emaciated thorax with ribs showing like the hoops of a barrel, beneath which is an irritable heart beating rapidly and visibly. The skin is dry, atrophic, leathery-looking, and pigmented, and the hair is dry, brittle, and scanty, the face shows some circumoral and supra-orbital pigmentation, and the nostrils are perhaps crusted with the evidence of epistaxis, and the conjunctivæ are icteric in tinge.

These are of course the text-book symptoms of kala-azar, by no means always present, but when they are, the *total ensemble* is striking and yields a vivid mental picture of the disease. In my experience this type of case is less commonly seen in the Lower Assam

Valley districts and least of all in Sylhet, where the type of disease approximates more to what one learned in one's student days to call by the resounding title of "malarial cachexia."

One suspects that this latter type is perhaps more commonly seen among adults, and that it is more chronic in its course. The enlargement of the spleen and liver seem more marked and the skin less atrophic and perhaps less pigmented. There is far more difficulty in finding among a number of cases from an infected village a clinically typical case of kala-azar, and were it not for the evidence derived by the identification of Leishman-Donovan bodies in splenic punctures, one would have some doubt whether, especially in Sylhet, the disease with which one is dealing is in fact kala-azar, or chronic malaria. The mortality of this type is probably much lower than that of the Upper Valley type, but as to this no definite evidence can at present be adduced.

CONCLUSIONS

The coincidence district by district of the different seasonal incidence of kala-azar onsets with what the writer had recognised, independently of the evidence of these statistics and prior to dealing with them, as the distribution of somewhat different clinical types of the disease, appears to him to add some significance to the indications of these figures. It is a commonplace of criticism that statistics can be made to prove anything, and those who know the many pitfalls which beset the path of an over-sanguine and incautious interpreter of Indian statistics, will share with the writer a large degree of mistrust of the conclusions to which in this instance they seem to point. Nevertheless, in spite of the possible fallacies which the writer has indicated, it is difficult to resist the suggestion of these figures that there are, in fact, two types of onset of kala-azar, one of which is in the cold weather months and prevails in Nowgong and Sibsagar, the other is in the hot weather months, and is found in the Lower Assam Valley districts and Sylhet. The writer would suggest that these two types have somewhat different clinical characteristics and possibly a different epidemiological significance.

If these conclusions are accepted, their entomological implications are fascinating, for if an insect vector is concerned, it would appear possible that the insects concerned with the transmission of these two different types of onset may have a different seasonal prevalence, and belong to different species, unless it be that the incubation period of the more chronic form of the disease is longer, although the time of infection is the same.

The thanks of the writer are due to those members of the special kala-azar staff who

have supplied the figures on which these remarks are based, and he hopes to be able to obtain their assistance in continuing these observations over a longer period with the object of confirming or disproving the conclusions suggested by the observations submitted herewith

FURTHER NOTES ON FILARIASIS

By S K. ROY, M B,

Asst-Surgeon on Filariasis Research Work, Puri

Developing filarial ova found in lymph—In our previous article* we tried to follow the developmental stages of the microfilaria prevalent here in *Culex fatigans*. Recently we had a unique opportunity to study another phase of the life-cycle of the microfilaria in its stages of development from the ovum. It is the generally accepted belief that filariæ are not oviparous but viviparous, and it is in the uterus of the adult female that the eggs are found at all stages of their development, until the mature embryos with fully-stretched sheaths are formed, and pass through the genital pore of the mother and appear in the lymph stream. Manson in his *Tropical Medicine*, says, "I have twice in filariasis found ova of the filaria in lymph, once in the lymph from a case of lymph scrotum, once in lymph procured by aspirating a varicose groin gland. Therefore at times filaria may produce ova instead of swimming larvæ." He thinks however that these ova are not natural products but are the results of some "hurrying of the process of filarial parturition," or miscarriage of the adult parasite due to injury. A remarkable statement attributed to Manson is however found in Sajous' *Cyclopædia of Medicine* (vol 3, page 341), "Manson found that the parent filariæ live in the lymphatics on the distal end of the glands, they are oviparous and their eggs are arrested in the glands and are hatched there. The free embryos then pass along the lymphatic vessels and enter the circulation."

Our knowledge of filarial ova is derived from two cases, one of lymph scrotum associated with chyluria, and another of hæmato-lymphuria. As there are many points of interest in these cases I give their case-histories in detail.

Case 1 H D, male, aged 45, clinical manifestations of filariasis for four years. For the first two years he used to suffer from periodic attacks of fever and lymphangitis of the scrotum, for the last two years he has been suffering from lymph scrotum from which clear lymph is oozing out almost continuously. Since the lymph commenced to ooze he has been free from fever. The lymph flow had a sort of periodicity at the beginning—flowed for a week or so and then stopped for a like period and so on. But for the last month it has been flowing incessantly. The flow lessens on taking rest at night and increases

on exertion and on scratching the part, which is constantly irritable. He has been suffering from chyluria also almost continuously for six months. There is pustular dermatitis over the part of the thighs which comes in contact with the exuded lymph. The scrotum, on inspection, was found to be a little enlarged, silky to the touch, the skin not much thickened, and the surface smooth. On scratching lymph oozes out from minute openings, and on pressure is ejected sometimes in fine jets. The blood contains a large number of microfilaria.

Examination of the lymph in this case under the microscope revealed a fair number of sluggish coiled up embryos (see fig 13a) which were at first taken to be ordinary microfilaria which had lost their usual motility owing to being present in an unfavourable medium, the lymph. But later on it was suspected that they might be really the developing embryos enclosed in the egg shells. Slightly heating the lymph after mixing it with dilute methylene-blue solution brought out the sheaths distinctly (fig 13b) and confirmed the suspicion. Henceforth a systematic and thorough daily examination of the lymph and chylous urine of this patient was undertaken and ova in various stages of development were found in fair numbers in the lymph and a few disintegrated ova in the chylous urine. It is a significant fact that only two fully stretched embryos were found in the lymph during the whole course of our examination of this case for ten days.

Ova in the following stages of development were found—

I Segmentation stage—ova circular in outline, margin distinct, colour dark-brown, full of small circular segments (fig 1).

II Segmentation complete, differentiation of cells at one extremity, forming parts of the embryo, outline slightly oval (fig 2).

III Differentiation of cells more advanced, outline of the embryo forming, coarse greenish granules inside the developing embryo (fig 3).

IV A distinct outline of the embryo formed, greenish granules inside it are fine now and constantly interchange position with one another, embryo rotates slightly to help the arrangement of the granules (fig 4).

V Granular arrangement inside the developing embryo more complete, embryo rotates inside the egg shell (fig 5).

VI Embryo well developed, its outline distinct, its movement not rotating now, but coiling and uncoiling of its body in different shapes. Muscular layer evidently forming, egg shell closely in apposition to the embryo (fig 6).

VII Well developed embryo—actively coiling and uncoiling inside the egg shell, which fits closely to it like a rubber glove and is being stretched in various ways by the movements of the embryo inside. The muscular layer of the embryo is being developed and the egg shell is being stretched in various directions (figs 7,8,9, and

10) Of all the stages these were the forms most commonly seen

VIII Egg shell is elongated and the embryo lies more or less straight inside it with the exception of its two extremities. The anterior extremity is found to take a prominent part in the stretching of the sheath (fig 11)

The case was operated on, and the part of the scrotum which exuded lymph removed. Disintegrated ova were found in the lymphatic tissues removed. Four or five days after operation, as there was now no exit for the lymph the patient got an attack of filarial fever

Case 2, B M, Hindu male, aged 40, was operated on for scrotal tumour three years ago. Previous to operation he used to suffer from fever and lymphangitis of the scrotum once in a month

in size, and contained much lymph, which came out if these masses were pricked with a needle or cut with scissors. Examination under the microscope of the lymph thus obtained showed lymphocytes, red blood-corpuscles, many fully stretched, living microfilariae, and some ova in the segmentation stage. He eventually got chyluria and from the chylous urine a reddish clot was obtained which also showed one or two living microfilaria. His blood was now found positive with regard to microfilaria

Examination of the chylous urine in these two cases and in a third case showed that the colour and the constituents of the urine are not the same in all cases of chyluria. In the first case described above the urine was whitish and opaque, but not always quite milky, and formed a reddish

Fig. 1

Fig 2

Fig 3

4

Fig 5,

Fig 6

Fig 7

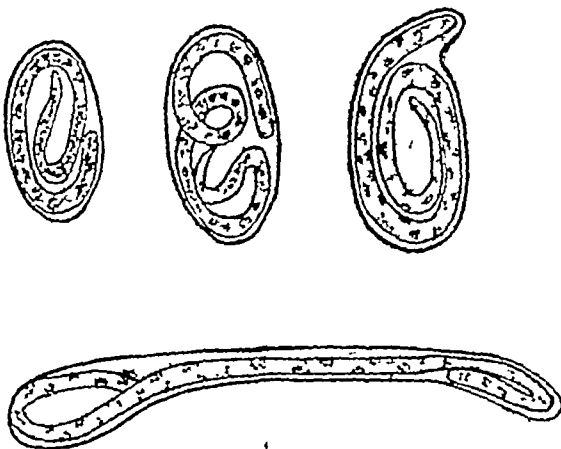
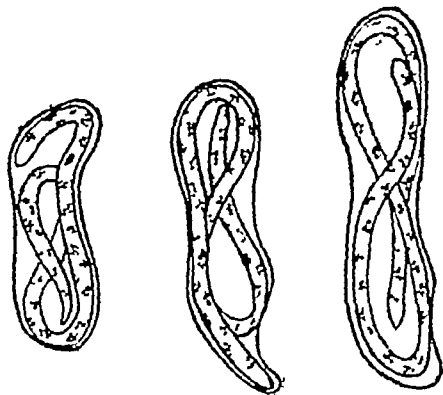
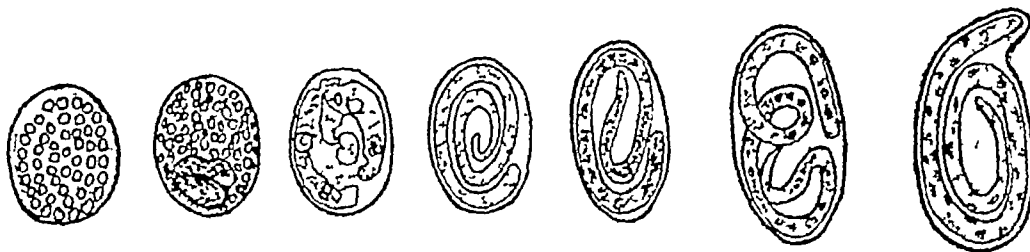


Fig. 11



Fig 8.

Fig 9

Fig 10

Fig 12

(a) Fig 13 (b)

The Development of a *Microfilaria bancrofti* from the ovum as found in a case of Lymph Scrotum

or two months. After operation he was free from fever for 2 years. He came to hospital about nine months ago with fever and acute lymphangitis of the right arm with *erysipelas-like* redness of the skin over the part, and again came seven months ago with fever and lymphangitis of the scrotum. No microfilariae were found in his blood at that time. He was then given eleven injections or 225 cc of antimony intravenously. This time he was admitted with retention of urine and was relieved by a soft catheter. In the urine there were many large lymphatic masses tinged with blood, which blocked the urinary passages and caused the retention. He also had varicose lymphatic glands in both inguinal regions. These lymphatic masses were found to be soft, irregular

clot when kept in a vessel, the second case started with hæmatolymphuria and then ran to chyluria and had typically milky urine, which coagulated rapidly on standing, in the third case the urine was red with a large admixture of blood. There were only 1 or 2 microfilaria and some ova in the reddish clot obtained from the urinary deposit in the first case, there were a large number of microfilariae and some ova in the lymphatic masses passed with the urine in the second case, no microfilariae or ova were found in the third case. There were abundant calcium oxalate crystals in the second case, but no such crystals in the other cases. Microscopically no fat was observed in any of the cases but there were plenty of lymphocytes and red blood-corpuscles. Only

in the second case was the passage of the urine painful and due to clots, in the other two cases it was free. A distinct relationship was observed in all the cases between the quantity of fat in the intestine and the chyluria, a rich diet in fact intensified the attack or brought on a relapse when the urine was becoming clear, and under starvation fat disappeared from the urine. All the cases showed microfilariae in the blood.

Another parasite which is said to cause chyluria is *Cercomonas hominis*. Here it may not be out of place to mention some causes of non-parasitic chyluria. These are tubercular nephritis, interstitial hepatitis, compression of the superior vena cava or of the portal vein in the presence of peritoneal effusions, also traumatism, cancer, syphilis (Giordano).

The points of interest in these cases are —

In the first case — (1) Stoppage of filarial fever as soon as lymph began to ooze out from the scrotum and reappearance of the fever when the oozing was stopped by operative measures, which shows that *filarial fever is mainly due to lymph stasis*. Stagnating lymph has little bactericidal power and hence is liable to frequent infection, which may be an additional factor in the causation of the fever. The disappearance of filarial fever for two years after removal of the scrotal tumour in the second case is also to be noted. (2) Passage of a large number of filarial ova at various stages of development in the lymph for many days at a stretch, but of only one or two fully stretched embryos during this period. If ova are not the natural products but are only the products of miscarriage of the adult filaria it is difficult to understand this continuous discharge of developing ova for many days in the lymph, which is continuously oozing out, as also in the chylous urine. Besides filarial ova have been found to stretch their sheaths quite freely in the lymph and these forms were the predominant ones in the lymph. From these observations one is inclined to believe that filariae are oviparous rather than viviparous. The small number of the fully stretched embryos is perhaps due to the fact that as soon as they have got fully stretched sheaths they leave the lymph stream, to gain access to the blood. They may thus wander to the anastomotic lymphatic channels and cause embolisms there and ultimately elephantiasis. It is to be noted that though many of the ova found in the lymph in this case were large, they could easily pass through the minute lymphatic channels and there was no ova embolism or elephantiasis of the part. (3) The appearance of *pruritus* and *dermatitis of filarial origin*.

In the second case — (1) An erysipelas-like attack of lymphangitis of the arm. (2) *Retention of the urine due to lymphatic masses of filarial origin*.

In this connection I would like to enumerate a few diseases which may be simulated by filariasis. These are — (1) *Malaria*, many cases of filarial

fever set in with a rigor and chill. (2) *Erysipelas*, (3) *Pyæmia*, for in many cases of filariasis there is a regular succession of filarial abscesses in the different parts of the body, and there may be associated fever. (4) *Abdominal colic*, or even (5) *Appendicitis* — as in the following case — G. D., aged 40, fever and intense pain in the right iliac region, due to filarial lymphadenitis of the deep iliac and lumbar glands. Afterwards lymphangitis of the scrotum and inguinal region, which gave the clue regarding the true nature of the case. Microfilariae present in the blood. Pain and fever remained for two or three days and then subsided. (6) *Stone in the bladder or urethra*, as in the second case mentioned above. (7) Urinary conditions such as *pyuria* and *lipuria* which may be confounded with chyluria. The diagnosis is by the microscope. In *pyuria* there are innumerable pus corpuscles, in *lipuria* the fat is not present in molecular form but in large drops or in fine needles and crystals. (8) *Lymphangitis* and *lymphadenitis* due to causes other than filariasis, e.g., *syphilis*, *pyogenic infections*, *tuberculosis*, etc.

A NOTE ON THE FIRST SIX MONTHS' WORK OF THE RADIUM INSTITUTE, AT RANCHI

By T. C. VAUGHAN.

LIEUT.-COL., I.M.S. (Retired)

It was in 1913 that I first started work with radium in this Province. The supply which I had was very small and had been obtained for a special case. Later on, as success with this was maintained within the very small limits of its applicability, Sir Edward Gait, Lieutenant-Governor of Bihar and Orissa, aided the work with a special grant in 1917, and in 1920 a scheme was put up which has resulted in the establishment of the present Institute — the first Radium Institute in India. Our buildings are not yet complete and we are working under difficulties but these latter are only the difficulties inherent in a new venture and we hope to go into our new buildings in March, 1923.

Our existence is only known at present to a comparatively few, and the scope of our work to perhaps fewer still, and experience of what can be done and is being done with radium is personally known really to a comparatively small section of the profession in India. Another difficulty is that where radium is known to the general public by virtue of its therapeutic uses there is on the one hand a tendency to expect too much from it and on the other hand it is to be regretted that within the last twelve months statements that it is "a failure" have been published in the lay-press, statements that as Hayward Pinch says, "appear to have originated in the pronouncements of some well-meaning but ill-informed practitioners concerning a subject of which they possess but very little personal

experience" Radium is not a failure when intelligently and scientifically applied in conditions amenable to its action. With reference to malignant disease one speaks not of cure but rather of arrest of the disease, or of the patient being clinically free from its manifestations. I have patients here "clinically free" since 1918, but what we do find is that even in the worst cases there is often so great a relief even though it be temporary, that one cannot but feel that it has been a great thing to have given this relief, and here in Ranchi in the first six months of this work one has naturally had a large proportion of cases in which malignant conditions have been so far advanced that nothing but a temporary "arrest" of the disease has been possible. Some of such cases have naturally relapsed into an uncontrollable condition and have died, but nothing else was possible. For in medicine everywhere it is a recognised condition that one must not delay treatment too long, and we are finding with regard to malignant conditions as far as we have recently handled them that they have been only too often too long delayed for radium treatment to be of real benefit. But that has been no one's fault, and now that the Institute is open we may hope to get an increasing proportion of cases at a stage when radiation can be really useful.

Before referring to our own cases I may briefly put the case for radium therapy as it stands to-day. Radium is now taking its place as providing the treatment of first choice in such conditions as leukoplakia, keloids, vascular naevi (birth marks), rodent ulcer, epitheliomas of all kinds especially in the pre-metastatic stage, or situated where surgical operation involves obvious scarring and much inconvenient loss of tissue. It holds now an undisputed place in inoperable cancer wherever situated, alleviating suffering, adding years perhaps to the patient's life, and in some cases banishing all evidence of the disease for as long as our experience with radium has so far extended. It would be useful perhaps at this stage to give some indication of the kinds of benefit that may reasonably be expected from radium treatment of various conditions both malignant and non-malignant. These have more than once been admirably summed up by Hayward Pinch, Arthur Burrows, Everett Lam and others, and the conditions coming under consideration may be roughly grouped as follows —

(1) Those in which cure in non-malignant conditions and apparent cure, or a condition clinically free of manifestations, in malignant conditions may be looked for and even anticipated with reasonable confidence. These include eczema chronic and seborrhœic, lichenification, keloids, papillomata, keratomata, corns, rodent ulcer, lymphosarcomata, sarcomata of the nasopharynx (Pinch), and I am inclined to add non-malignant hæmorrhages from the uterus, and small fibroids.

(2) Those in which great benefit both local and symptomatic may be expected, including psoriasis, xanthelasma, xeroderma pigmentosum, Fordyce's disease, leukoplakia, capillary naevi (port wine marks), spring catarrh, lupus erythematosus, lupus vulgaris, tuberculous adenitis, vicious cicatrices, Dupuytren's contraction (early stages), exophthalmic and parenchymatous goitre, splenic and lymphatic leucocythæmia, lymphadenoma, mediastinal tumours, epitheliomata of the skin, cornea, vagina and urethra, carcinomata of breast, uterus, bladder, prostate and thyroid, sarcomata (excluding endosteal cases) endotheliomata, angioneurotic oedema, arthritis deformans (early infective cases), (Pinch), and I am inclined to add certain larger uterine fibroids.

(3) Those in which the result is doubtful *viz* — pruritus, neuralgia, neuritis epithelioma of tongue, mouth, fauces, larynx and œsophagus, carcinoma of stomach, intestine and rectum, myelomata melanomata, glycosuria (Pinch).

(4) Those in which radium treatment is practically useless, *viz* — Dupuytren's contraction (later stages), kraurosis vulvæ, adenomatous goitre, osteitis deformans, acromegaly, lipomata, enchondromata, osteomata, endosteal sarcomata, syphilis, sclerotic diseases of the spinal cord, paralysis agitans (Pinch).

Radium treatment may be regarded as satisfactory in most benign new growths, vascular naevi (birth marks), moles, papillomata, warts, keloids, uterine fibromata and non-malignant uterine hæmorrhage. In cases of inoperable and post-operative cancer, Hodgkin's disease, and lymphatic leukaemia radium has been found to give comfort, prolong life, and even at times to give an occasional freedom from clinical manifestations, for at any rate such length of time as we have thus far been able to cover in our experience, *viz* from 1913 to the present date. In precancerous lesions such as senile keratomata, leukoplakias, epitheliomata (in premetastatic stages) of skin or mucosa, on the lips, near the eye, limited to the cervix, and in non-suppurative tubercular adenitis, radium treatment should be the treatment of first choice. Such conditions as those of the toxic goitres, chronic and hypertrophied tonsils, cancer of the bladder, and prostate and rectum have been a doubtful zone and have been the subject of endless debate. Some of them react, others fail hopelessly and yet as the work goes on, the tale of real successes is added to.

I think I have given enough of a general indication of the lines on which we may ask the profession generally to co-operate with us and secure for patients such benefit as is possible from radium treatment. Naturally we have had so far a very great preponderance of cases of malignant disease, but I would emphasize the point that our activities are by no means limited to treatment of cancer only. Most of our malignant cases have been those of the female generative organs. I am not doing more now than

giving general indications for the co-operation from the profession that I ask for, and in this connection as far as this very large and important section of disease is considered I cannot do better than quote Louis Frank's general conclusions. These are as follows —

(1) Cancer of the uterine body treated by total ablation of tubes and ovaries and uterus yields curative results which we cannot hope to surpass by any other form of treatment

(2) In early carcinoma cervicis although the radical operation continues a justifiable procedure in the hands of the best operators, equally good if not better results, considering the primary mortality, are obtained by radium treatment

(3) All border-line cases should be treated with radium

(4) Late cases may be improved and palliated by radium as by no other means at our command

(5) If the five-year period of curability* is to be accepted as indicating a "cure," then the results of radium treatment surpass by far those obtained by the profession at large in the treatment of cancer of the cervix by surgical means

Practitioners sending up for treatment cases of uterine hæmorrhage would, I think be well advised whenever practicable to submit the patient in competent hands to a thorough curettage and the curettings should be saved for very careful microscopic diagnosis. No case of fibroid tumour of the uterus should be sent up for radium treatment in which there is good evidence of pelvic or adnexal inflammatory trouble or in which there is evidence of adnexal growth. Such cases should be passed straight into the hands of a surgeon and if subsequently sent up should bring a report from the surgeon. When a case of fibroid of the uterus is sent up for radium treatment, because of its being inoperable the gynæcologist or surgeon would greatly help us by a letter giving sufficient clinical details to assist us in avoiding the dangers arising from the existence of possible contraindications to treatment with radium. We ask for this help because such written opinions are very helpful and because our staff is small and is fully occupied and much inconvenience may be avoided to patients by a careful preliminary consideration by medical men sending up cases, for fibroids and bleeding uteri are not all plain sailing. When a curettage is done it would be a great help if a report on the microscopical findings be sent to the Institute and that it be stated for convenience and future reference where that microscopical examination was made, and it would be better if these preliminaries were gone into and the Institute consulted *before* the patient comes up for treatment.

Now as to our own cases—the table attached gives a resumé of these under various headings, which speak for themselves. To take these *seriatim* —

* I presume Louis Frank means a five-year period of being "clinically free" of the disease.

Cancer of the Uterus twenty-two cases

With the exception of one border-line case all were inoperable. The border-line case, discharged in June 1922, has comparatively recently reported that she is free of symptoms and she and nine others were clinically free of symptoms at the time of discharge, and no reports of recurrence among them have up to date been received. Two cases were discharged as improved. In both these the local growth at the time of discharge had entirely disappeared, but they had both been such very advanced cases that early recurrence was considered as quite probable and hence both cases have been shown as "improved." Of the cases not improved—one was a case of recurrence after total hysterectomy for columnar-celled carcinoma. The precise extent of infection in the case at the time of operation was not stated in the report from the operating surgeon. She left here on the 6th October, 1922. Her medical attendant wrote me on 26th October, 1922, saying she was free of any further trouble but the growth has recurred since and she is again under treatment at the time of writing. A second case was absolutely hopeless from the first and when she came to us was in her second recurrence. A third case was exactly similar, and in her third recurrence. The fourth case was a very extensive carcinoma and hopeless practically from the first. She left on 18th September, 1922, and has had a recurrence. One case died the day after admission and the case in which we abandoned treatment showed evidence of involvement of the kidneys and was sent home as further treatment was deemed useless. It is evident that the majority of these cases were really too far advanced for anything but palliation to be hoped for. The earlier that cases of cervical cancer are sent up, the greater will be the hope of success.

Cancer of the Bladder—We have had but one case and he was absolutely beyond anything but hope of palliation. He died shortly after treatment with symptoms of uræmia and at the time of his last application he seemed to give evidence of secondary growth in the lung.

Cancer of the Breast—Of these, one was a very advanced case with a huge fungating mass 6 inches across in the left breast. This was about three-quarters healed when she gave evidence of deep pleural and peritoneal infection with cancer and further treatment was abandoned. A second case complained of pain in the chest and in the scars of the three operations she had previously undergone for cancer of the breast. She was examined under X-rays by Major Shorten and the skiagram showed a small shadow at the root of the right lung. Examined again on 25th October, 1922, this shadow was very much lighter and she was free of pain and trouble. Her treatment may be regarded as only one of prophylactic radiation after operation. The third was one of prophylactic radiation of scars and chest after operation for cancer of breast. She has been

seen since and as far as we know definitely there has so far been no recurrence of her growth. The fourth case was sent up to us as incipient cancer after mastitis. We considered this a doubtful case and she is included here on her medical attendant's diagnosis. She left with both breasts in a normal condition, for although she still had a little serous discharge from the nipple on the affected side the thickening in the breast had disappeared.

Cancer en Cuirasse—This was a very enormous ulcer of about ten years' duration. The local condition improved considerably for a time but later on numerous metastases in the skin appeared and further treatment was abandoned as there was also evidence that lymphatic obstruction in the axilla, which at first was much reduced, had again recurred.

Rodent Ulcer of Scalp—This was an enormous ulcer of about ten years' duration measuring $5\frac{1}{2}$ by $5\frac{1}{4}$ inches. This patient is still under treatment and the ulcer is reduced to about $2\frac{1}{2}$ by 3 inches and is healing definitely.

Sarcoma—One case is under treatment and is very much improved. The second was a hopeless case of sarcoma of the upper jaw, operated on in Calcutta and recurring after operation with involvement of the other maxilla. He improved considerably for a time and then grew rapidly worse and died. A third case was a very bad recurrence in the posterior triangle of the neck that had recurred in three weeks after operation. He never really improved at all. The fourth case was a very hopeless one—a huge sar-

coma growing up from inside the pelvis that had been bleeding very severely. She died very shortly after admission from hæmorrhage.

Endotheliomas—Of these one was a recurrence after radium treatment before the Institute opened. He never really improved. A second was a recurrence after operation who also never improved. Both these have abandoned treatment. A third had a huge fungating mass nine inches across and absolutely hopeless looking. He improved greatly under treatment but died of exhaustion from a septic diarrhœa. The fourth case has completely subsided, being reduced to a small knot of fibrous tissue.

Fibroid Tumours of the Uterus—Of these, two cases are clinically free of symptoms. A third left very much improved and has since been reported as practically free of symptoms. Of the remaining two, one was a huge tumour extending to four fingers above the umbilicus and left with the growth a little over half-way between pubis and umbilicus. She reports since that she continues improving and that the growth has shrunk considerably since she left. The fifth was a case of fibroid extending to a little above the umbilicus and is considerably better and still under observation.

It is evident from the above that most of our cases so far have been very far advanced ones and as the profession continues to co-operate with us we may hope for more cases in the earlier stages of their complaints, when radium treatment may be confidently expected to give better and better results.

Classification of Cases

Disease.	Examined but not treated	Prophylactic radiation only	Clinically free	Improved	Not Improved	Abandoned treatment.	Still under treatment	Dead	Total
Carcinoma—									
Uterus			10	2	4	1	4	1	22
Bladder								1	1
Breast		3			1				4
En Cuirasse					1				1
Oesophagus	1								1
Laryngeal									1
Buccal, Oral or Lingual	2					1	1		2
Rectum					2		2		6
Rodent ulcer				1					1
Sarcoma							1		1
Epithelioma face							1	3	4
Lupus exedens							2		2
Endothelioma	1		1		2		1		1
Fibroid of uterus			2	2			1	2	7
Menorrhagia			1				1		5
Tubercular glands	1		1						1
Disease of bone	1								1
Enlarged spleen				1					1
Enlarged tonsils				1					1
Ca aract		1							1
Chronic conjunctivitis									1
Leprosy	1				1				1
Cyst on thyroid	1								1
Keloids	1								1
TOTAL	9	4	14	8	11	2	14	7	69

A SCHEME OF MEDICAL INSPECTION OF SCHOLARS IN SECONDARY SCHOOLS

By Dr A HAMID, B SC., M B., B S.,

Formerly Medical Inspector of Schools, Sind

THE following scheme of Medical Inspection of scholars in schools is derived from the different methods of its working in different provinces. It will be found necessary to make certain alterations according to local conditions, but the pros and cons of different points are dealt with on the basis of the work done on these lines, which has proved that considerable alterations will have to be made with more experience in a task which is of the greatest importance, which has been misunderstood even by the medical profession, and which does not claim to attract the admiration of the laity by any wonderful results in a short time.

This scheme is thus drawn up mainly with a view to start a discussion among those interested, which is bound to evolve a more suitable procedure for work.

The task is a gigantic one. A reconnaissance of the whole field is at first necessary in order that a knowledge of the existing common defects, slight or severe, may be brought to light. For this purpose the statistics of the present state of the schoolboy's health must be collected. Then the factors bringing about these conditions should be looked into, and for this purpose the state of health of the child must be watched from time to time. There is a two-fold purpose in the work, investigation and the improvement of conditions.

At first it will be advisable to start the work in Secondary schools. Primary schools are certainly the seminaries where the foundation is laid, both of virtue and vice, physical or otherwise. But most of the children in Primary schools cannot be traced upwards successfully and a considerable part of the work in the beginning will be wasted. A general co-operation of parents, which can be judged from the class of boys in Primary schools, cannot be counted upon at this early stage.

In Secondary schools the children have in a way been sorted out and are likely to stay for some length of time, whilst development and growth is still going on and whilst they are still susceptible, moreover at this stage they begin to look after themselves. Later on in college they are more or less beyond the susceptible stage. The usual age in Secondary schools is 8 to 18, the majority being between 10 and 16.

There are several methods of grouping children for medical examination. One mode consists in grouping boys of the same age together. This method has the advantage of

giving a summary according to age groups, but it upsets the school work, as children of the same age have to be hunted out from different classes, and their records cannot be sorted out easily for subsequent examinations.

Another and more easily practicable method is to first examine all children of one class and then to pass on to another. This will demand a special form for the synopsis of the day's work. This form will be shown later on to be of great importance as it gives the summary not only according to age groups, but caste groups and other groups which are of medical importance.

As an example of the last the summary will show cases of enlarged cervical glands in different groups where enlargement may be associated with conditions of the scalp as distinct from those of mouth breathing.

It will be better to examine the children every year, but to start with three examinations should be insisted upon. Thus three classes will be examined every year, the lowest, the middle and the highest. These three classes will include children of all ages who usually attend the Secondary schools.

In order to create an interest among the parents and to have some idea of the previous condition of the child and conditions at home a notice of invitation is sent to the parents for the first examination only. It needs no repetition at subsequent examinations. Its two sides are shown below as Form A. It is frequently of considerable importance in the examination.

Two boys are first called from the class, one goes into the room for medical examination and the other stays outside. As soon as the former is free he returns to the class and sends No 3 meanwhile No 2 is undergoing examination. Thus examinations are conducted with continuity and the class work is not disturbed, which latter is bound to happen if the whole class is called up at once. Each boy brings his form A filled up by his parent, also a sheet of Medical Record (Form B) in which the entries in the first portion have been filled up by the teacher.

The details of a Medical Record can be varied considerably, but first it must be decided whether individual sheets are to be used (card-index system), or whether the records should be bound in a book. Both have their advantages and disadvantages, but the former is decidedly better. The chief advantage in the latter is this that the sheets are not liable to be lost and they are in one compact place. Besides this it gives facilities for making a summary directly from the book with any combination of groups, although it will involve a good deal of turning over of pages. But for this purpose the book has to be carried to the Medical Inspector's office which is

not convenient unless the schools are in the same locality

This is the first disadvantage. Another very serious disadvantage consists in having to hunt out the same boy again from the register at a subsequent examination, as all boys of the same class do not keep place together throughout their career and even if they did they could not be presented in the same sequence as before unless an extra register of order and sequence is kept. The Medical Inspector's time is limited, he works during school working hours only and he is handicapped by school holidays or half holidays and the above mentioned disadvantages cannot ensure a regular succession of boys at his call.

The card-index system consists in using a card for each boy and loosely filing the cards of the same class in one file, the cards requiring a slight re-arrangement with the formation of new classes each year. This is a handy and convenient method, the cards are distributed to the members of a class and they present themselves for examination in regular succession at any time of the year. There are two objections to this method, one has already been mentioned, *viz.*, a possibility of the loss of cards. Secondly, the cost of a wooden box with drawers for different classes is an appreciable item. In some places wooden boxes are used, but as mentioned above the use of file boards will cost much less. Or boxes can be made from kerosene oil tin canisters at a low price.

Form B is a model of a Medical Record in which all the common defects found in the school-going-boy have been entered. Many more items can be entered but would make the list too lengthy. The arrangement of items is not upon a systemic basis, but this or some similar arrangement ensures a speedy examination of the case. The notes explain several items in detail.

The examination for adenoids requires a little explanation. "Visible" adenoids will be very few, and can be seen by depressing the tongue only. But the majority will be hidden, and require digital or instrumental aid, a tongue depressor and a small laryngeal mirror. As few instruments should be used as possible, it will mean less expense and also it ensures greater confidence on the part of a child who, though hale and hearty, has to submit to medical examination. A tongue depressor, which may sometimes break the caste, can be replaced by a less aseptic pencil, of course a bowl of lotion should be kept near at hand by the examiner. The digital examination is much too rude a method to be practised in school precincts.

As to leprosy it will be seen that the anæsthetic type has been given importance in the form, but it will be politic not to give the nodular type the same prominence. "Patches

of anæsthesia" is as harmless as the word "leucoderma," but the latter should be entered under 20, if present.

Weights should be recorded in seers which is more intelligible to the Indian mind than Avoirdupois terms.

All examinations require tact, particularly that of the genito-urinary system, which should be undertaken only at the request of parents or boys themselves, and it is for this reason that the system has not been given any prominence in the record sheet.

The examination of eyesight deserves special mention. The vision should be recorded in each and every case and in case of defects correcting glasses should be prescribed. A good many cases, especially of myopia below 6/18 can be safely trusted to subjective examination, but youngsters among whom eye defects are not so common should be examined objectively and preferably under a mydriatic. This will involve a dark-room and will certainly mean more time. But taking everything into consideration about thirty boys can be examined in a day of five hours, leaving the dark-room cases for a holiday or a half-holiday. It will be found that in some of these cases one will have to be content with only issuing a form of advice to the parents, as volunteers for atropine are not easily forthcoming. However it should be borne in mind that sometimes, especially in the mofussil, the medical man will be pestered by volunteers for eye examination. Also educated parents are keen on a thorough examination of the eyes and it is better if numbers have to be sacrificed to efficiency in this direction.

Existing defects should be brought to the notice of the parents by issuing warnings under the signature of the Headmaster. The notice may be issued in any form, and one is shown in Form D, which can be printed on postcards. If a bigger sheet is used it will be advisable to explain the significance and results of bad teeth, enlarged tonsils, sore eyes, etc., at the back. An essential aim of the scheme is to educate. Some may be too poor to afford hygienic means of living but ignorance is more responsible than poverty. There is plenty of sunshine and air in India which have not been vitiated by smoke and for which nothing is to be paid, but there are few who know their value and utilise them. It is therefore necessary to deliver lectures on subjects of everyday hygiene for boys as well as parents, but a special preparation of the subject must be made, inasmuch as it is necessary that the subject should be rendered free from all technicalities and illustrated by experiments and even a magic lantern. The coming generation, when they grow up into parents, will be in a position to influence their children and so this work will gradually bear fruit.

The Medical Record is to be turned to useful account by a careful summarising of defects in different groups of age, caste, social status, etc. The relation of one defect to another can be worked out and this will prove a very interesting feature of the work. This will show how common caries of the teeth is in childhood and how insidiously pyorrhœa alveolaris takes hold of its victims. Extensive caries of the temporary teeth leads to caries of the permanent set too, which exhibit irregularities leading to mouth breathing, enlargement of the tonsils, respiratory disease and otorrhœa. In order to work out such relations it is necessary to take a copy of the Medical Records of the day's work to the Medical Inspector's office, which will mean filling up the necessary items of the Records of about 30 boys on a sheet of paper (Form C) every day after work is over. This should not take more than 15 minutes. There is no need to take down the names of boys, initials will suffice.

The items in the final analysis will depend upon the wants and demands of the Educational Department too. A very useful Form originally devised for the purpose by Lt-Col J W D Megaw, I.M.S., is shown as Form E. This analysis is drawn from the summary of the individual records taken to the Medical Inspector's office on Form C. The terms in such Forms should be of a non-technical nature.

FORM A

From The Head Master, School, 19
Date

Dear Sir,

It has been arranged that the health of the children attending the school should be periodically examined with a view to its improvement, and with this object the Medical Inspector will examine your son ward
, on at about

Some information about the health of the child in the past is necessary to know the conditions which affect his health adversely. I request, therefore, that you will kindly fill in the form below as accurately as possible and return it to me before the date of examination. It will be of great help in examining the child if you could spare a little time and attend the school at the time of examination.

Yours very truly,

Head Master

Form to be filled in by the parent or guardian

- 1 Name
- 2 Age (last birthday)
- 3 Place of residence
- 4 Past illnesses
 - (a) Pain and swelling in joints
 - (b) Glands (i.e. swellings) in neck
 - (c) Cough with fever
 - (d) Any throat trouble?
 - (e) Difficulty in breathing
 - (f) Defect in eyesight or headache when reading
 - (g) Irregularity of bowels
 - (h) Does he take exercise regularly in the open air?

- (i) Continuous fever for several weeks together
- (j) Small-pox
- (k) Spleen
- (l) Did he ever have fits of fainting?
- 5 Is he a vegetarian or non-vegetarian?
- 6 Occupation of father or guardian
- 7 Any other remarks

Note—Only "yes" or "no" should be written against (a) to (l)

FORM B

Medical Record No
of
son of
pupil of School,

Caste

Birth date

Height in inch s

Age in Year and Month

Weight in seers

Class

NB—To be filled in by teacher

Previous Medical History

- | | |
|----------------------|---------------------|
| (a) Small pox | (b) Continued fever |
| (c) Dysentery | (d) Enlarged spleen |
| (e) Epilepsy or fits | (f) Vegetarian |

Vaccination marks

Occupation of parent or guardian

NB—Information obtained in Appendix A from the parent or guardian

Date of examination (with name of School if different from above)

- 1 Chest { Girth in inches at rest
Capacity of expansion
- 2 Nutrition
- 3 Cleanliness { (a) Clothes
(b) Body
(c) Head (Hair)
(d) Nails
- 4 Nose { (a) Obstruction
(b) Catarrh
- 5 Ears { (a) Discharge
(b) Defective hearing
- 6 Mouth, Teeth and Gums { (a) Mouth breather
(b) Cleanliness
(c) Caries
(d) Sepsis
- 7 Throat. { (a) Tonsils
(b) Adenoids
- 8 Cervical glands palpable

- 9 Respiratory System { (a) Bronchitis
(b) Asthma
Pulmonary { (c) suspected
Tuberculosis { (d) Definite
- 10 Circulatory System { (a) Anæmia.
(b) Excited heart.
Heart { (c) Function
(d) Organic.

(Continued on page 66)

FORM-B—(Continued from page 64)

Date of examination (with name of School if different from above)					
11	Spleen (enlarged)				
12	Skin { (a) Furuncles (b) Scabies (c) Ringworm (d) Eczema				
13	Speech { (a) Defective (b) Stammering				
14	Mental deficiency				
15	Nervous defects				
16	Patches of anæsthesia				
17	Physical deformity { (a) Bow back (b) Lateral curvature of spine (c) Club foot (d) Irregularity of teeth				
18	Rickets				
19	Eye { (a) Trachoma (b) Acute or subacute conjunctivitis (c) Squint. (d) Corneal opacity Acuteness of Vision { (e) Right (f) Left				
20	Other diseases and malformations				
Medical Inspector's recommendation and instructions					

Note—

- 1 If there is nothing abnormal present under any heading the space opposite should be left blank
- 2 Defects should be indicated by + (plus) or - (minus), whichever may be necessary, e.g., Against No 3 minus will indicate defect, Against Nos 4 & 5 plus will indicate defect, Against No 6 plus will indicate defect, except for the item of "cleanliness"
- 3 Against No 2, plus indicates good nutrition and general physique, minus, poor or bad, and blank, fair
- 4 Against Sepsis in 6, put one, two or three signs of plus according to the degree
- 5 Against Anæmia in 10, the degree of apparent anæmia should be indicated by one, two or three signs of plus
- 6 Against No 11, one plus indicates enlargement which is just palpable, two indicates 4 fingers below rib margin, and three, greater
- 7 No 12 to be defined by A, B, C or H which respectively indicate the positions, arm, body, chest and head
- 8 No 16 should be defined by locality in words
- 9 No 20 includes genito-urinary system, goitre, other deformities, diseases, etc, not already mentioned Their nature should be indicated
- 10 The following should be defined by —R or L (right or left), as the case may be
4 (a), 5 (a), (b), 7 (a), 17 (c), 19 (a), (b), (d)

FORM D

School

Warning

Your son
ward, has
trouble, for which you ought to consult a doctor It is earnestly requested that this matter be not neglected

Date

Head Master

N B—This form can be printed on a post card

THE MERITS OF THE AYURVEDIC SYSTEM OF MEDICINE

By ASHUTOSH ROY, L M S,

Hazratbagh

IN the editorial article on the "Indigenous System of Medicine" in the April 1922 number of the *Indian Medical Gazette*, the Editor has taken a very reasonable attitude in asking the advocates of the "Indigenous system" to prove their claims before they can be recognised by the State and money spent upon their "restoration and teaching" The following are the personal impressions of the writer who is not a *kabiraj* but a practitioner of Western medicine, from his study of Ayurvedic books—

The Ayurvedic System of Medicine—Anatomy, physiology, chemistry, botany, pathology, bacteriology, surgery, midwifery, hygiene and jurisprudence—in all these departments the modern Western system is decidedly superior There remain the theory and practice of medicine, materia medica and dieto-therapy where the "indigenous system" can show a few points in its favour

I *The Theory and Practice of Medicine*—The basis of the "Ayurvedic system" is the so-called "Humoral theory"—the tripod of *vayu*, *pitta* and *kapha* on which "Ayurved" stands "This theory has unfortunately been misunderstood by Western scholars" is what Mahamahopadhyaya Gananath Sen, M A, L M S, a leading *kabiraj*, has stated in his address at the opening ceremony of the Benares Hindu University (1916) A host of other *kabirajes* supported him,

Dr A T Brock, M D, in his "Galen on Natural Faculties" has said that "our modern conception of hormone action shows certain resemblances to this theory (the humoral theory of the ancient Greeks and the present humoral theory of Unani medicine which is borrowed from the ancient Greek system)" The writer believes that a similar analogy exists between hormone action and the humoral theory of the ancient Hindu medicine *Vayu* represents the nervous system (cerebro-spinal and sympathetic), *pitta* and *kapha* are two antagonistic hormones

The following are the points in common between "Hormones" and the "Humours" of Ayurvedic medicine—

- (1) That the endocrine glands "from some points of view are antagonistic to each other"

Dates of Inspection _____

Dates of last Inspection _____

1	2	3	4	5	6
No on roll on 1st day of Inspection	No examined by age groups	Caste distribution	Distribution according to diets	Average Weight in <i>seas</i> by years	Average Height in <i>inches</i> by years
Average No. present during days of Inspection					
Total examined	Total	Total	Total		
8 9 10 11 12 13 14 Total	15 16 17 18 Total	(a) Hindus (b) Mahomedans (c) Christians (d) Parsis (e) Others Total	Vegetarians Mixed diet Total	8 9 10 11 12 13	11 12 13 14 15 16 17 18
Average chest measurements in inches by years					
at rest expansion	at rest expansion				
6 8 9 10 11 12	13 14 15 16 17 18				
12 Ears	15 Eye sight	14 Eye Diseases	16 Teeth and Gums	17 Throat	17 Nose
(a) Healthy (b) Defective hearing (c) Discharge	(a) Good (b) Defective (c) Very defective	(a) Healthy (b) Acute Eye sore (c) Chronic Eye sore (d) White spots	(a) Healthy (b) Decay of teeth (c) Sepsis (d) Irregularity of teeth	(a) Healthy (b) Enlarged tonsils (c) Slight Moderate Great	(a) Healthy (b) Catarrh (c) Adenoids (d) Slight Moderate Great
18 Enlarged glands	19 Skin	20 Anemia	21 Heart	22 Lungs	23 Speech
(a) None (b) Neck glands	(a) Healthy (b) Bolls (c) Itches (d) Ringworm (e) Eczema	(a) None (b) Slight (c) Moderate (d) Severe	(a) Healthy (b) Excitable (c) Diseased (d) Definite Indefinite	(a) Healthy (b) Bronchitis (c) Tuberculosis (d) Suspected	(a) Normal (b) Defective (c) Stammering
24 Enlarged spleen	25 Physical deformity	26 Bones	27 Others	28	
(a) Nil (b) Just palpable (c) Moderate (d) Great	(a) None (b) Bow back (c) Curvature of spine (d) Club foot	(a) Healthy (b) Diseased			

(T Bodley Scott) *Pittva* and *kaphya* hormones are antagonistic to each other (*vide* Sajous' "Pressor and Depressor substances" in this connection)

(2) There is absolute interdependence between the endocrine glands and the sympathetic nervous system and the broader outlook of a sympathetic-endocrine system will aid materially in clearing many obscure conditions (Detwiler) The *pittva* and *kaphya* hormones are entirely dependent on the *vayu* force

(3) "Life is an expression of the balance between the sympathetic nervous system and the glands of internal secretion" Health according to Ayurved is the result of the harmonious action of *vayu*, *pittva* and *kaphya*, for as soon as the delicate balance is upset disease results

(4) There is "close analogy between vitamins and hormones," the former are supposed to stimulate formation of the latter Each article of diet in Ayurved had been studied from its influence on *vayu*, *pittva* and *kaphya*

(5) "Pharmaco-Endocrinology" according to Sajous "will reveal the true significance of drugs as weapons against disease" Each drug in the Ayurvedic materia medica has been studied from its effect on *vayu*, *pittva* and *kaphya*

(6) The two sympathetic chains are opposed to each other (*vide* vagotonia and sympathtonia) The same we find holds in the Ayurvedic system

Leonard Williams says that "to unravel the intricate and esoteric mysteries of the glands of internal secretion" which deal with the secrets of life itself "there is danger of drifting into metaphysical study" It must be stated that the ancient Hindu physicians drifted into the same spirit (*vide* Charak)

The facts and theories of the sympathetic-endocrine system as we find in Ayurvedic books, if studied, will give much food for thought to the assiduous student of scientific medicine, for according to Leonard Williams "to-day, tomorrow and the day after are fore-ordained to the physiologist, the physician and the therapist Their hour has come through the agency of the glands of internal secretion"

The practice of Ayurvedic medicine depends on the classification of diseases, the use of drugs and foods on the basis of the sympathetic-endocrine system or the so-called humoral theory of wind, bile and phlegm which is an unfortunate misnomer

The theory and practice of Ayurvedic medicine may therefore be summed up in one chapter only of scientific medicine dealing with the sympathetic-endocrine system

The "aim" of the indigenous system is to cure diseases and the "result" is in many cases successful A calm and unbiassed observation will convince any one that in some cases of illness at least the treatment by "indigenous drugs" is superior to that of Western medicine

The following cases will suffice to illustrate the point raised —

The writer remembers, several years ago, a baby who suffered from convulsions and the conjoined efforts of the writer, the Asst-Surgeon, and the Civil Surgeon for several days were of no avail in checking the disease The relatives of the patient waited in vain till they sent for a *labiraj* from Ranchi who had a reputation for curing such obstinate cases of convulsions in infants and the baby was cured in a couple of days, had no recurrence and has now grown into a fine boy The writer could not persuade the *labiraj* to reveal the nature of the drug he used and which he kept a secret

Recently a case of neurasthenia in a boy of 16 years of age was diagnosed by a Calcutta *labiraj* as due to *sukra* and *vayu* derangement, which scientifically means a deficiency of internal secretion of the testes affecting the pituitary gland and causing the disease It is indeed a marvel how the *labiraj* could recognise so correctly the cause of the derangement, having had no scientific training at all

II *The Ayurvedic Materia Medica*—Every medical man practising in India is more or less aware that the indigenous materia medica is full of drugs unknown in the West Exaggerated claims have no doubt been made for some of them, but like *chaunmoogra* oil in the hand of Sir Leonard Rogers, many drugs will be found in the Ayurvedic pharmacopoeia which will become useful instruments in treating diseases when studied according to the Western standard

In connection with indigenous drugs, Lord Pentland, a former Governor of Madras, stated "As far as medicine proper is concerned, this country (India) is specially favoured, for it affords a variety of remedies and a width of traditional experience, to which few countries can lay claim How then can these remedies and that experience be most profitably adapted to the service of mankind? Only by bringing to bear upon them the latest results of methods of scientific analysis and research In medicine there is no room for different systems, its methods and its aims must be the same, and medicine, whether it is called Ayurvedic, Unani or Western, must submit to the same tests All medicines therefore should be subjected to the same strictest tests and exhaustive investigation before they are admitted to the *Materia Medica*" (*Indian Medical Gazette*, March 1918)

A study of the traditional experience as to the use of drugs in the indigenous system will be of great help to research scholars on indigenous drugs

III *Dieto-therapy*—There is no doubt that the exponent of the Western system of medicine, European or Indian, though he fully understands the principle of dieto-therapy, is often handicapped in prescribing suitable diets for Indian patients A chapter on Indian dietetic preparations will always be a welcome addition A scientific analysis of the different invalid diets ought to be undertaken

Some work has already been done in this connection, but fuller analysis of the various salts and vitamins should be done in connection with individual food-stuffs and the information obtained should be collected and arranged as an authoritative exposition of the subject. It will be interesting to study the chapter on diets in Ayurvedic and Unani medicine, to find out the "traditional experience" there, which, like that concerning drugs, will be of great help to research scholars on the subject.

In connection with indigenous diets the late Sir Pardy Lukis said on a memorable occasion "Study Indian prejudices especially as regards rules of diet in connection with illness. When you are called in to see an Indian patient, the last question will be put to you—what about diet? If you order an article of diet which, according to Indian ideas, is contraindicated in the class of diseases with which you are dealing, if, for instance, you commit the horrible blunder of ordering milk in a case of bronchial catarrh or rice for a patient suffering from malarial fever, you will never be called in again by that family. Above all, do not fall into the grievous error of regarding these prejudices as nonsensical. The longer you live in India, the more intimate your connection with Indians, the greater will be your appreciation of the wisdom of the ancients and the more completely will you realise that the West has still much to learn from the East" (*Brit Medl Journal*, Oct 1913).

These "prejudices" regarding diet are based on a popular knowledge of Ayurvedic medicine and hence the necessity of studying them to find out the rationale of the different diets recommended in different diseases.

Conclusion—At the All-India Medical Conference held at Delhi in December, 1918, Sir Nilratan Sarkar in his Presidential Address said "Students and Teachers of Western medicine generally ignore the *kabirajes*, but it is not the right attitude. It is necessary that they should study and assimilate the truths contained in the indigenous system."

In the Madras Council in November 1915, the Hon'ble Mr Cardew pointed out that two lines on which research would be useful are a critical study of indigenous medical books and an investigation of the action of indigenous drugs.

If therefore the Ayurvedic and the Unani systems are modernised and the truths found in them studied and absorbed into Western medical science there will remain no difference between the various systems of medicines, for they will merge into one scientific medicine which will become alike the common property of the East and the West.

Considering that the bulk of the population resort to indigenous medicine and as this state of things will continue to exist for some time to come, it is all the more necessary to modernise the indigenous systems of medicine.

A Mirror of Hospital Practice.

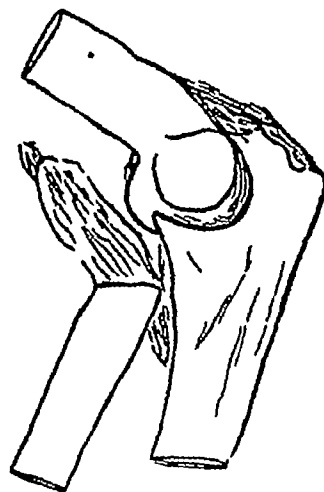
RARER TYPES OF FRACTURES

By M. L. TRESTON, F.R.C.S. (Eng.),

CAPTAIN, I.M.S.

THE cases of fracture described here are not of very frequent occurrence and may be of interest from the standpoint of treatment and ultimate prognosis.

Case No 1—Fracture of the neck of the radius (L).



CASE No 1—Fracture of Neck of Radius

Sepoy B—S—, æt 20, admitted 24th January 1922, with old fractured dislocation of the head of the radius.

History—Seen six months after the accident. Had been treated with an internal angular splint, and later sent to his home on leave.

Condition on admission—(a) Arm wasted, (b) Extension to 120 degrees, (c) Flexion to 90 degrees, (d) Pronation and supination limited, (e) Head of radius felt above and in front of external epicondyle.

A tracing of the skiagram is appended (fig 1).

Treatment—Excision of the head of the radius.

Progress—Uneventful.

The result of treatment here was excellent, a striking contrast to Case No 2.

Note

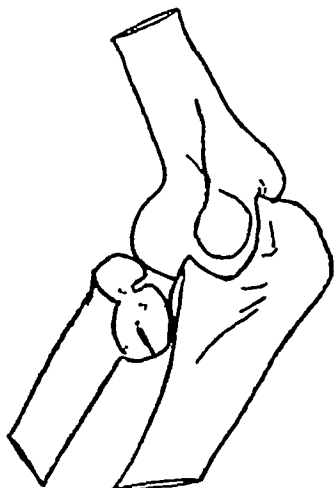
With reference to Dr J Shortt Evers' article on 'Echinococcal Infection of the eyeball' in the *Indian Medical Gazette* for October, 1922, the author asks us to insert the following—

Extract from Pathological Report on the Echinococcal Cyst

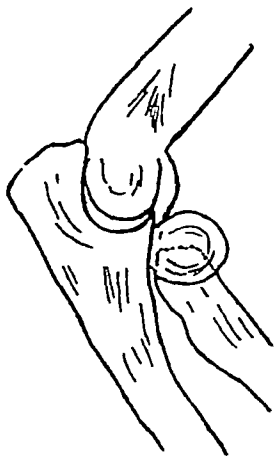
"The cyst originated in the orbital tissues behind the globe and pushed the eyeball forwards. The proptosis presumably resulted in corneal ulceration with escape of the ocular contents and collapse of the globe. The exposed conjunctiva and cornea became covered with granulation tissue and eventually a dense white fibrous layer was laid down which covered over the collapsed globe anteriorly. All the other part of the description coincides with that previously given."

Case No 2—Sowar K—K—, æt 22
Fracture of the head of the radius (R)

Admitted on 24th February 1922, complaining of swelling and pain in the right elbow, due to a fall. Fractured head of radius diagnosed, confirmed by X-rays. Tracing of skiagram attached (fig 2)



CASE No. 2 A.—Fractured Neck of Radius (R)



CASE No 2 B.—One week after Excision of the Head of the Radius Showing (1) Ossification of the Capsule of the Joint (2) Outgrowth of new bony tissue from the severed end of the Radius

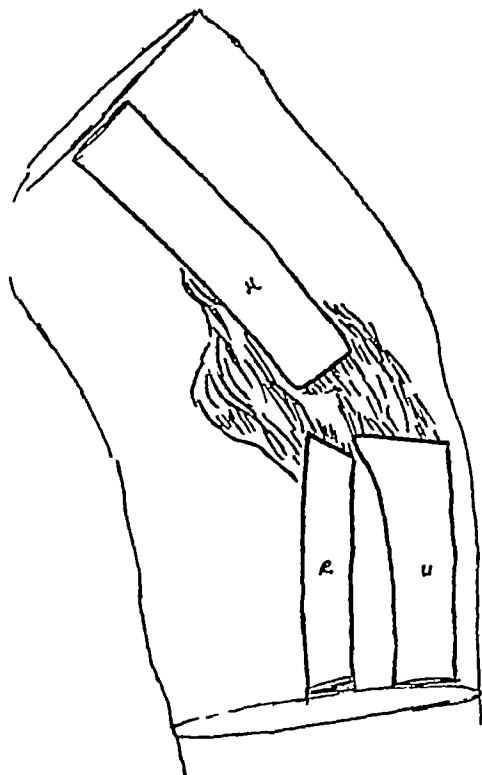
Operation I—Excision of head of radius. It was observed that the orbicular ligament was partially calcified.

Progress—A tracing of a later skiagram (fig 3), demonstrates —(1) Calcification of posterior and internal aspect of capsule. (2) Slight calcification, tendon of Triceps (3) An irregular flame-shaped area of new bone formation running up and out from the severed end of the radius.

Operation II—Excision of the elbow, marked calcification of the capsule which was removed.

Progress—A tracing of a skiagram, (fig 4), shows marked infiltration of tissues round the area of excision, with new bone formation.

The ultimate range of movement was —(1) Extension—full (2) Flexion to 55 degrees (3) Pronation and supination free

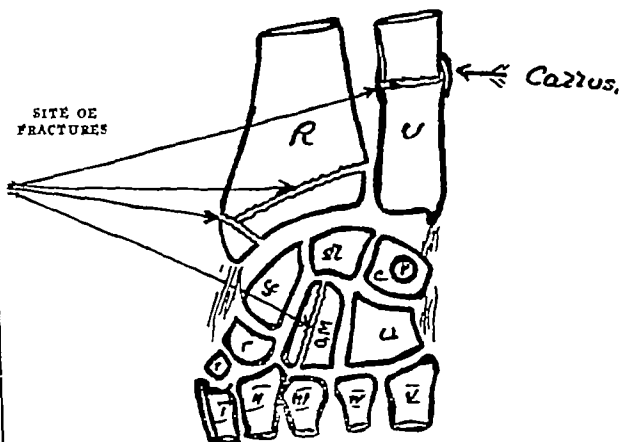


CASE No 2 C.—Ten days after Excision of the Elbow Showing the excessive formation of new bony tissue round the severed ends of the bones

The result here might be described as indifferent, the peculiar feature of the case being the excessive activity of the osteoclasts and osteoblasts.

Case No 3—Fractured radius, ulna and os magnum (R)

Admitted on the 6th February 1922, complaining of swelling of the right wrist and hand, due to a kick from a horse.



CASE No 3 —Fracture of Radius, Ulna and Os Magnum

Diagnosis—Colles' fracture, with fracture also of the ulna two inches above wrist joint

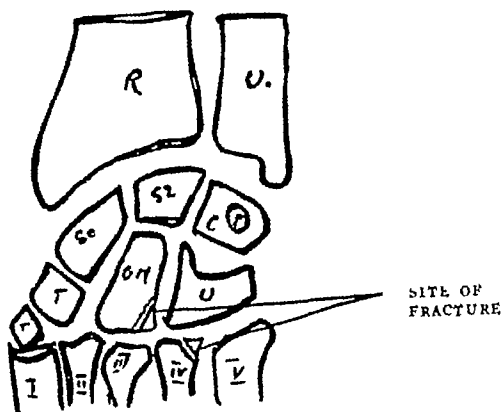
X-ray showed fracture of radius, ulna and os magnum Sketch appended (fig 5)

The case was treated *secundum artem*, passive movement and massage being done from the first day

Progress—Twenty days after the injury — (1) Firm union (2) Movements in all joints excellent (3) No tenderness on carpal "tapping"

The case was seen two months later and had progressed uneventfully The case is of interest from three standpoints — (1) The fracture of the os magnum (2) The absence of later osteoarthritic changes (3) The T-shaped fracture of the lower end of the radius, involving the wrist joint

Case No 4—Fractured os magnum, and 4th metacarpal This would be more accurately described by substituting the word "chipped" for fractured The injury was due to a fall some six months before, and there is still slight weakness of the wrist, but otherwise nothing remarkable (fig 6)



CASE No 4—Fractured Os Magnum and Base of 4th Metacarpal

Case No 5—Compound fracture—dislocation L Ankle

Dr M—, æt 22

This case rather aptly illustrates the importance of conservative surgery, the final result being beyond all expectations He was admitted with a history of having fallen off a cart, the wheel of which went over his left ankle

On examination—There was a transverse tear in the skin, 3 inches long at the level of the ankle joint Through this rent the tibia, broken off at the base of the internal malleolus and with its articular surface intact, protruded The whole of the lower surface of the bone, with the exception of the internal malleolus, lay outside the skin There was also a comminuted fracture of the fibula, 2 inches above the ankle joint

Under chloroform anæsthesia the bone was replaced and the torn periosteum sutured The wound was thoroughly "bipped," and partially sutured a small drain being put in, down to, but not into, the joint cavity

Examined eight months later, the condition of

the limb was as follows — (1) Skin wound healed (2) Some thickening of the internal malleolus (3) Movements at ankle joint excellent

There was some pain, which the patient complained of on walking, and the foot was slightly abducted

EXPULSIVE HÆMORRHAGE AFTER CATARACT EXTRACTION

By S K. GANGULY, M.B., Calcutta

MRS D, aged seventy-three, a patient of Dr V K Chatterjee, was brought to me by her son for the treatment of dim vision

Right Eye had vision = finger count at four feet Left Eye had vision = finger count at six inches Both eyes had shallow anterior chambers, well reacting pupils, 'black' cataracts and a normal tension But the large lens and shallow anterior chamber suggested a tendency to glaucoma She had no other ocular or constitutional symptoms or signs Accordingly I advised extraction of the left lens and told her son that there was a reasonable chance of recovery of some useful sight, although the cataract was bad in type

After a good clearing of the bowels of the patient the previous day, under cocaine and adrenalin her left cataract was extracted with a large incision, and iridectomy, and capsulotomy About five minutes after the operation, on the table, her left hand began to shiver and a little pain was felt in the eye She was put to bed and kept warm, when the shivering and the pain abated but presently she started vomiting and crying out "my heart!" The pulse was all right but the part of the bandage on the left side of the nose was tinged with blood About three hours after the operation she had a violent pain in the eye and felt as if her eye was coming out and the bandage was now soaked with blood Bromides and ice did her little good The bleeding stopped by evening, although the vomiting and sickness continued for three days more

Previous to this operation, I used to give a hypodermic injection of morphia to every patient before the operation and all of them used to feel sick afterwards One of the patients who was eighty-five years old vomited for two days after the injection although he did well afterwards and had good sight This effect of morphia prevented its use in the case of the lady in question

The eye was dressed 24 hours after the operation The signs of expulsive hæmorrhage were present except the bleeding The protruding vitreous, iris, etc were cut off and the conjunctiva was replaced The wound healed in seven days There being no hæmorrhage, nor pain, nor willingness on the part of the relatives of the patient, enucleation was not performed

Unfortunately in private practice this is my fourth case of intraocular and third case of expulsive hæmorrhage (*vide Calcutta Medical Journal*, December 1922) Maddox says expulsive

hæmorrhage "occurs scarcely more than once or twice in an average ophthalmic surgeon's life time" (*A J O Series 3, Vol 3, p 23*),

"Soon after the operation, it may be before the patient is removed from the couch, great pain sets in. On removal of the dressings they are found to be saturated with blood, while the corneal flap is turned downwards, the wound is gaping, and through it blood clot, vitreous and iris protrude. The hæmorrhage is from the retinal or choroidal blood vessels which are atheromatous. The accident, which is rare, cannot be foreseen and the eye is always lost" (*Swanzy*).

Vomiting as a sign of expulsive hæmorrhage is not mentioned in the ordinary text-books.

Maddox had to extract a cataract from the second eye of a patient "after the fellow eye had been lost by expulsive hæmorrhage" having been operated on "by one of the ablest and most esteemed London surgeons, due of course to no surgical fault on his part" because the latter surgeon "could not be persuaded to touch" the second eye. His method, which resulted in success, was as follows —

I Preliminary iridectomy (at least one week before the extraction)

II Preparation of the patient (a) By suitable constitutional treatment for some time beforehand (b) By mercurial purging, milk diet, and calcium lactate the previous night

III Administration of bromide and morphia on the morning of the operation

IV Just before the extraction — (a) Cutting a large vein in front of the same side as the eye to make it bleed profusely (b) Pricking the episcleral veins of the same eye

V During the extraction — (a) Performing the operation on the patient's bed (b) Raising the head of the patient (c) Keeping the feet sedulously warm (d) Application of hot turpentine stupes on the abdomen to draw the blood thitherwards

VI After the extraction — (a) Suturing of the corneal wound (b) Gentle compressive bandage

THE RATE OF GROWTH OF VESICAL CALCULI

By R. F. A. MACGREGOR, MB MRCP,
MAJOR, I.M.S.

THOMSON and Miles in their *Manual of Surgery*, 1909, p 713, state that "little is known of the rate of growth of vesical stone" and that "Guyon believes that a uric acid stone takes several years to attain a diameter of two inches". The following case, as throwing a little light on this point, may be of interest.

R, a patient from Farah, Afghanistan, was operated on for vesical calculus by the suprapubic route in August 1914, in the Sistan Hospital. Records show that one stone only was removed, nothing is mentioned as to its size or weight. The patient states that he remained

in good health until the summer of 1918, when symptoms of urinary irritation and hæmaturia came on, at first slight, but each year becoming worse until this year when they compelled him to make the journey to Sistan again for treatment.

On 5th November, 1922, that is, 8 years and 3 months after the first operation, I removed, by suprapubic cystotomy, two stones, one weighing 1 oz 2 drms and being 4.8 cms long by 3.75 cms broad. The other is a very small faceted stone and is perfectly formed, so it is not a broken-off piece of the larger stone. It closely resembles the terminal phalanx of the little finger. Both are uric acid calculi.

There was no sacculation of the bladder and nothing to suggest that a stone had been overlooked at the first operation. The stones lay free in the bladder cavity and were removed without difficulty.

The patient's present age is about 65.

TREATMENT OF CHRONIC GONORRHOEA A FEW CASES

By CAPT A. P. PILLAY, OBE., MB, BS

Of all the diseases which a doctor is called upon to treat, chronic gonorrhœa is one of the most intractable. Often it drives both the patient and the doctor to despair. For all practical purposes, cure may be taken to mean stoppage of the discharge and non-recurrence of it on any diet, drink, or intemperance. Even the general practitioner ought to know how to tackle these cases. All cases recorded as "cures" in dispensaries and by practitioners are not real cures, and it is common to see the patient go from doctor to doctor for a permanent amelioration of his symptoms.

The choice of treatment lies between the following methods —

1 Administering medicines by mouth. The drugs used for this purpose are — *Copaiba*, *Sandal-wood Oil*, *Cinnamon Oil*, *Cubebs*, *Buchu*, and *Hydrastis*. Dalton recommends, among other drugs, *Kava Kava*, *Salix Nigra*, and *Oil Cassia*. Lautier speaks highly of *Cedar-wood Oil*, 2-8 gms, daily (*Prescriber*). Also there are a large number of patent medicines on the market.

2 Injections into the urethra of various astringent lotions 3 or 4 times a day by the patient himself by a small syringe. *Zinc Sulphate*, *Argyrol*, *Protargol*, *Alum*, *Acriflavine*, etc., are used for this purpose.

3 Lavage by some suitable lotion of the anterior and posterior urethra. The drugs used are *Pot Permanganate*, *Hydrarg Perchlor*, *Acid Boric*, *Acid Carboic*, *Ichthyol* (*Dalton*), *Zinc Sulph*, etc. *Acriflavine I* in 3,000 or 4,000, *Silver Permanganate* and *Mercurochrome* are also very efficient (*Prescriber*).

4 Regular prostatic massage through the rectum, at least every other day This should press out all the discharge from the prostate

5 Instillations of strong solutions of drugs that kill gonococci Silver Nitrate and Protargol seem to be the most efficient Argyrol is useless for this purpose Carbolic and Iodine in 1 per cent solution is recommended by Dalton Special instillators or ordinary female catheters can be used for the purpose

6 Injections of vaccines and phylacogens There are many of these available

7 Introduction of ointments, pastes, or powders into the urethra Unna's treatment is as follows—Coat sounds with the following paste and pass them into the urethra—

R

Ol Cocæ 3 oz
Cerei Flav $\frac{1}{2}$ dr
Argen Nitras 15 grs
Balsam Peru $\frac{1}{2}$ dr

Finger suggests introducing through a catheter the following ointment—

R

Silver Nitrate 15 grs
(or Copper sulph)
Lanolin 3 oz
Ol Olivæ $1\frac{1}{2}$ drs (Hare)

8 Electrolysis (*Prescriber*)

Cure is impossible without active local treatment Vaccines alone do not seem to have any curative effect

The following cases show the result of various treatments—

The best results were obtained by—

1 Lavage twice daily for 7 to 10 days After that once a day, combined with 4 or 5 hand injections by the patient himself

2 Every other day rectal prostatic massage, followed by instillations of Protargol (40 grs to 1 oz) or Silver Nitrate (8-16 grs to 1 oz) A drachm of the solution is used

3 Any convenient preparation of Copaiba, Sandal-wood Oil, etc, is used internally Hewlett's mixture containing these seems to meet the purpose

4 Absolute prohibition of alcohol, sexual excitement and intercourse

5 Reduction in nitrogenous materials and spices in the diet

6 Correcting any other illness, such as pyorrhœa alveolaris, anæmia, debility, etc

Case 1—R., Hindu, age 45 Duration 3 months All local treatment refused Alkaline mixture and capsules containing Copaiba, etc, 6 months After 2 weeks Hewlett's mixture Treatment for 1 month Result failure

Case 2—A., Indian Christian, age 32 Duration 2 years Lavage could not be done as the patient was living in another station Hand injections 4 or 5 times a day of a lotion containing Carbolic, Zinc Sulph., and Alum. Occasional instillation with Argyrol (30 grs to 1 oz) Rectal massage was not done as he had hæmorrhoids By mouth the same mixture as in case 1 2 months' treatment with no improvement. Tried 6 hypodermic injections of gonococcus vaccine (Parke

Davis & Co) No effect. 6 hypodermic injections of urethritis combined vaccine (Parke Davis & Co) No improvement Had an autovaccine prepared from patient's discharge, and gave 12 injections of this No appreciable change Next gonorrhœa phylacogen was given intravenously 6 times No cure. Treatment lasted 6 months At this time patient left the district.

Case 3—V., Hindu, age 40 Duration 4 months Same internal treatment as in case 1 Regular lavage was allowed but no other local treatment 3 weeks' treatment Temporary "cure." Relapse after a month

Case 4—D., Hindu, age 26 Duration 2 months 4 weeks' treatment as in case 1 Failure

Case 5—M., European, age 34 Duration 2 months Same medicines as in case 1 Regular lavage twice a day, for a week. Then once a day combined with hand injections Rectal massage and instillations of Silver Nitrate on alternate days Marked improvement after a fortnight. One night he indulged in excess of alcohol and intercourse Acute inflammation of the prostate and neck of the bladder the next day All local treatment stopped till these passed away Then they were begun again After about 5 weeks the patient was completely cured

Case 6—P., Indian Christian, age 55 Duration 8 months Symptoms also of acute prostatitis Same treatment as in the last case Suspected stricture sounds were passed one day, but no stricture found Instillation was done only twice, with Argyrol solution 4 weeks' treatment Result—cure. Was advised to take urotropin for a month after he left off treatment

Case 7—R., Parsi, age 26 Duration 2 years Was "cured" 3 times before Though he was dieting himself, and avoided alcohol and sexual intercourse, relapse every 4 or 5 months Treatment as in case 5 He had 8 instillations of Silver Nitrate solution There was marked improvement in the discharge, but the "morning drop" persisted He had severe pyorrhœa alveolaris, but refused to be attended to by a dentist Euthymol tooth paste and some tooth drops were prescribed 6 injections (hypodermic) of urethritis vaccine (Parke Davis & Co) were given Also 2 instillations of Protargol Decided improvement in his pyorrhœa alveolaris and his gonorrhœa was cured Whether the pyorrhœa alveolaris had anything to do with his discharge persisting so long, and whether the injections of the urethritis vaccine had a good effect on his pyorrhœa alveolaris, I could not say Treatment lasted 6 weeks He has now been free from all trouble for the last 9 months, though there is now no restriction in his diet, drink, or habits

Case 8—M. S., Mahomedan, age 35 Duration 9 months Treatment began as in case 5 After 2 days of rectal massage, Protargol instillations and lavage, the patient insisted on having all local treatment stopped and desired to have vaccine treatment. 4 injections of urethritis vaccine and local hand injections of astringent lotion 5 weeks' treatment. The case came to the stage of gleet and all further progress stopped

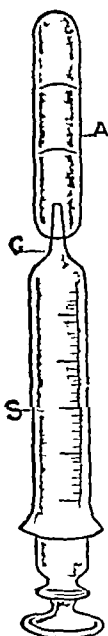
Case 9—F., Indian Christian, age 36 Duration 1 year Rectal massage and instillations with Silver Nitrate, and lavage were only irregularly done Treated for 3 weeks "Cured," but had a relapse after 3 weeks Regular active treatment for another 2 weeks cured him completely Patient complained of passing "threads" in the urine from the prostate. Mixtures had no effect on this condition Cured without any medicine after 4 weeks

Case 10—X., Parsi, age 26 Had gonorrhœa 3 years ago One day he suspected he saw a little discharge from the urethra Insisted on a course of active treatment. On massaging the prostate there was a glairy discharge with a few shreds of opalescent matter Microscopical examination could not be done Rectal massage and Protargol instillations on 3 alternate days After the treatment, nothing could be pressed out by prostatic massage, though tried on 3 successive days Probably only prostatic secretion

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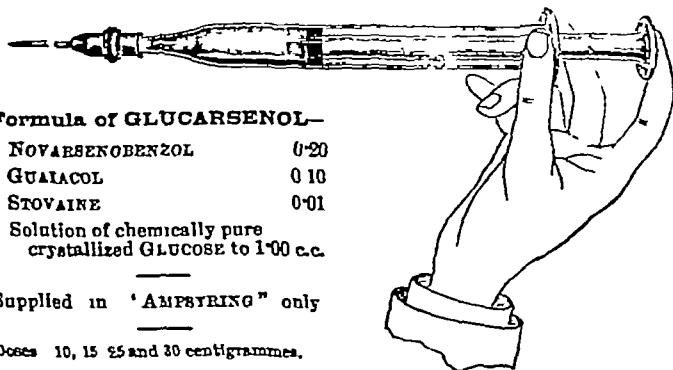
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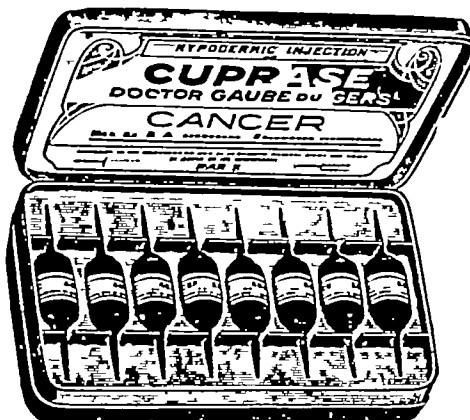
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Indian Medical Gazette.

FEBRUARY

A LIVE MUSEUM

VERY few medical museums can be described as "live", most of them would more fittingly be described as "dead" in more senses than one. It is probably for this reason that so few people feel inclined to spend time in them.

It will be a revelation to those who visit the Wellcome Museum in Endsleigh Gardens, London, for they will find it the *museum of their dreams*. Thanks to the munificence of Mr Wellcome it has been possible for Colonel Balfour and Mr Daukes to fit up a museum which is not only a great illustrated encyclopædia of tropical diseases, but also a vivid and orderly picture from which the visitor can obtain a clear conception of the whole subject. Even if he has only a short time at his disposal he will come away with fresh ideas of the whole field of tropical diseases, but if he is more fortunate in having more leisure he will be able to obtain, in the most attractive form, a clear insight into each and every disease which is specially common in the tropics.

Bernard Shaw once propounded the revolutionary view that children at school should be at perfect liberty to get up and leave their classes if they did not feel inclined to stay. It is possible that the doctrine was not meant to be accepted quite seriously, as it is hardly possible to find a supply of ideal teachers who will be able to interest their pupils to such an extent as to combat the counter-attractions of games and the other distractions which appeal to the young mind, but still there is a great germ of truth in the suggestion, as it is quite certain that far too little attention is paid to the presentation of instruction in an attractive and lucid form.

The museum with which this note deals is a good illustration of the advantages of the orderly and pictorial method of education. The museum founded by Mr Wellcome forms a part of the Wellcome Bureau of Scientific Research which is entirely divorced from the commercial side of the great firm of Burroughs and Wellcome. This bureau, under the able

guidance and control of Dr Andrew Balfour, is carrying on a great work with a large staff, of which men of the highest scientific attainments, such as Wenyon and Brown, are members. The museum has a whole-time staff including Mr Daukes who has a special genius for the work. With ample means at his disposal Mr Daukes is constantly employed in making additions and improvements to the museum, and so the collection is absolutely up-to-date.

Medical men from India should pay their visit to the museum at the earliest possible moment. They are sure to wish to go again and again as there is material at their disposal which will demand a long period of study.

The arrangement of the museum is particularly clear. The ground floor is given up to hygiene and the upper three floors to tropical diseases and special sections, such as entomology and medical zoology in general. By a simple system the visitor to the museum is kept on the right path and he is able to distinguish between the essential and the unessential and also between proved facts and unproved suggestions.

The grouping of diseases is on a scientific basis, diseases spread by insects are grouped together, while diseases spread by alimentary tract infection are on the second floor and those due to deficiency are on the third floor. Each disease is dealt with in an orderly plan according to history, distribution, etiology, symptomatology, pathology, treatment and prophylaxis.

A small guide to the museum is issued and can be obtained at the entrance, but this is in no sense a catalogue, as each exhibit is so fully described that a descriptive catalogue is quite unnecessary.

In each section there is a summary of the recent literature of the diseases dealt with, so that the materials exist for a detailed study of any disease in which one is interested. In the same building is an up-to-date reference library containing all the important books and journals on tropical medicine and hygiene.

It is obvious that a full description of the Wellcome Museum would form a text-book of tropical diseases of an exceptionally full and graphic kind, but enough has been said to indicate the great value of the museum, especially to visitors from the tropics.

The museum appropriately is next door to the London School of Tropical Medicine. It is hoped that a museum on similar lines but naturally on a less lavish scale will shortly be available for the students of the Calcutta School of Tropical Medicine and for medical visitors who will always be welcome to inspect the exhibits.

SIR WILLIAM EDWARDS

It is with deep regret that we have to announce the departure from India of Major-General Sir William Rice Edwards, whose long and valuable service in India culminated with his appointment as Director-General of the Indian Medical Service during the years 1918 to 1923.

It is not only the members of the Service who regret his departure, Sir William was the friend of the entire medical profession in India and, like his distinguished predecessor Sir Pardey Lukis, he was fortunate in commanding the affection and respect not only of the doctors of India but also of a large circle of friends among the laymen of the country. Sir William was one of the very few Director-Generals who put the interests of the medical services and medical profession of India before his own personal interests, and the honours and distinctions which he was fortunate enough to receive were in no way the result of appeasing officialism at the expense of the interests of the profession.

Sir William was under no illusions as to the future prospects of the declining Service to which he belonged, but he never allowed a spirit of pessimism to interfere with his efforts on behalf of the Service, and it is for this reason that he has commanded to a very special extent, the admiration and love of his fellow officers.

We wish many years of health and strength to Sir William and Lady Edwards on their retirement.

The following is a brief record of the service of Sir William —

General Edwards joined the Indian Medical Service in 1886 and, when a Captain, in 1891, was surgeon to the then Commander-in-Chief in India. On attaining his Majority, he was attached to Lord Roberts' staff during the South African War in 1901. General

Edwards spent a good deal of his time in the Political Department in various Residencies and was Administrative Medical Officer in the North-West Frontier Province from 1910 to 1913. He was Surgeon-General to the Government of Bengal in 1915-18, when he served as President of the Bengal Medical Board, and was appointed Director-General of the Indian Medical Service in 1918, from which appointment he now retires.

He held administrative control of the Central Research Institute, Kasauli, the Medical Store Depôts at Madras, Bombay, Calcutta, Lahore and Rangoon and also of the X-ray Institute at Dehra Dun. Sir William served in an honorary capacity on various scientific boards and committees, and was President of the Scientific Advisory Board of the Indian Research Fund Association, the General Committee of the Association of Pasteur Institutes of India, the Governing Body of the School of Tropical Medicine, Calcutta, the Governing Body of the Lady Hardinge Medical College, the Central Health Board, India, and Drugs Manufacture Committee. There is hardly a medical institution in India in which Sir William Edwards has not left an impress of his experience and knowledge and keen administrative acumen. He was a member of no less than eleven committees in India and as Surgeon-General, was a member of the Bengal Legislative Council, and as Director-General, a member of the Legislative Assembly and Council of State. During the period 1900-23 he received various decorations, which included the C M G, C B, K H P, and K C I E, and, as a mark of appreciation, His Majesty's Government conferred on him the title of K C B.

Sir William is succeeded by General McWatt whose record in India justifies us in hoping that he will carry on and maintain the same high standard of disinterested service to the medical profession in India, and to him we offer our congratulations and a hearty welcome.

AN EPIDEMIOLOGICAL NOTE ON KALA-AZAR

ON page 52 of this issue we publish a most interesting, yet most puzzling, paper by Lieutenant-Colonel T. C. McCombie Young, I.M.S.,

Director of Public Health, Assam, on "The Season of Onset of Kala-azar" A circular was issued to all members of the kala-azar survey and kala-azar dispensary staffs in Assam asking them to ascertain and report in connection with as large a number of cases as possible, the month of the year in which the patients stated that their disease had begun and Colonel McCombie Young analyses the 5,011 case-returns thus obtained

He begins first by examining the credibility of the figures obtained Firstly, he considers that the vast majority of the 5,011 cases reported on are true kala-azar and that chronic malaria is here not to any appreciable extent mixed up with kala-azar in the returns The Assamese know only too well what kala-azar is whilst in most of the cases, either the clinical diagnosis of kala-azar has been confirmed by a positive aldehyde reaction, or verified by positive findings on spleen puncture Secondly, he considers that usually the onset of kala-azar begins with a sharp initial attack of fever of sufficient severity to fix itself upon the patient's memory This latter point may, perhaps, be a little open to question

Conceding these two points, however, an analysis of the figures brings out new facts of an extraordinarily interesting character The time of onset curve for all Assam shews a maximal peak in May, a minimal point in September, and a secondary rise in November (his chart I) And if we study his successive charts 2 to 8 and pass from the spreading margin of acute kala-azar in Sibsagar and Nowgong down the Lower Assam Valley, to the Surma Valley and Sylhet where the disease is sporadic and clinically of a more chronic type, we find three outstanding features *viz* (I) in almost every curve September is the month of minimum incidence of onset, (II) almost every curve shews a definite secondary peak in November, but (III) in Sibsagar the maximum peak of the curve is in January, in Nowgong it is in February, and as one passes down the Province from acute and spreading kala-azar to Sylhet, where the disease is sporadic, the maximal peak in the curves gets later and later, until in Sylhet it is in July

Interesting and puzzling as these statistical returns are, one possible explanation at once suggests itself Although the modes of onset of kala-azar and the temperature charts in the

disease may vary very widely, yet there are two clearly marked clinical types of onset, as pointed out by Dr Napier *viz*, (a) acute cases which begin with an "enteric-like fever" Not a few of Dr Napier's recent kala-azar cases, cases verified as kala-azar by finding *L donovani* on spleen puncture, have been "typhoid cases discharged cured" from other Calcutta hospitals (b) Secondly, in more chronic kala-azar cases we often have a mode of onset simulating that of chronic malaria, but associated with progressive enlargement of the spleen and liver And the difference between the January peak in Sibsagar and the July peak in Sylhet might be explained as perhaps due to the prevalence of acute kala-azar with a typhoid-like mode of onset in Sibsagar as against a malaria-like type in Sylhet with an incubation period before symptoms set in, prolonged by five or six months longer than in the Sibsagar cases Yet the extraordinary way in which the Sylhet curve corresponds in September and November with the curves for almost every other district in the Province negatives this explanation

It is interesting to deduce entomological but perhaps rather wild speculations from these important findings For instance, suppose that kala-azar is transmitted by some domestic, blood, sucking insect and that the average period of incubation to symptoms in kala-azar is about six weeks, assumptions which are perhaps not very far from the truth Then going back six weeks from the three chief points on the curves we may ask—"Is there some such insect especially associated with kala-azar in Assam? Is it an insect which is especially absent from human habitations throughout Assam in July and August, during the rains, and six to eight weeks prior to the September minimum incidence, which is rather prevalent however in October, with the cessation of the rains, and six weeks prior to the November peak but whose season of maximal incidence (or possibly infectivity) changes as one passes down the Valley from about December in Sibsagar, January in Nowgong and so on, to May and June in Sylhet?"

Speculation, however, must be held within rein and what is now wanted in connection with the problem of kala-azar transmission is further work rather than further guessing

Colonel McCombie Young's paper suggests that unsuspected evidence may come to light from a closer study of the known epidemiology of the disease. From a Government communiqué we learn that there is danger lest the "economy axe" should descend upon his post. Yet, surely if there is one department in India which deserves well of the community, it is the Public Health Department in Assam—a department which has not merely grappled, and that most successfully, with one of the most fatal scourges of Assam, has not merely held and coped with the disease in its epidemic form—despite our ignorance of how it is transmitted—but has saved thousands of lives, brought hope in place of despair throughout the infected districts, and exercised a hygienic and educational influence throughout the whole community of no mean order. The measures taken by the Assam Administration to stamp out kala-azar have been vigorous, well conceived, and very thoroughly carried into execution. We hope that in spite of the financial stringency and the administrative difficulties that it necessarily entails, it will be found possible to retain intact the Public Health Department, which has justified its continued existence by the results of its work.

Current Topics.

The Mode of Action of Selective and Specific Drugs.

At a meeting of the Medical Section of the Asiatic Society of Bengal on the 15th of November 1922, a paper was read by Major H. W. Acton, I.M.S., on "The Mode of Action of Selective and Specific Drugs."

Major Acton first defined such terms as the "pH" or potential of the hydrogen ion concentration of a fluid, iso-electric point, and ampholytic character of such drugs as act either as bases or acids at an optimum iso-electric point. Thus the *Bacillus botulinus* produces a toxin which is extremely active at a pH of 12, trypsin requires a pH of 8, pepsin bases one of 7 to 7.2. From this he passed to the modern conception of the atom as a miniature of a stellar system, held together by electric or "gravitational" charges and with an electro-gravitational field around it. Einstein's theory of relativity shewed that the doctrine of the conservation of matter and energy was only valid whilst energy was not being given off from the system concerned. The mass of an atom was held together by the positive electric charges on its nucleus. It has been shewn that light absorbs or emits energy dependent on the gravitational fields. The molecules of a drug are attracted to or repelled by parasites by the electrical forces present in the field of action.

The action of drugs which are selective remedies for certain infections depends upon—

(1) Their chemical constitution. Alkaloids, for instance, act as bases and require an alkaline environment. Amines—animal or pressor bases—each require their own optimum iso-electric point. The polarimetric optical form of the drug may be of importance. Dextro and lævo-rotatory compounds may have very different therapeutic values. The conditions present in the substrate and the possibilities of ionization may be important.

(2) The alkalinity or acidity of the tissues, as expressed by their pH reaction. Thus at a pH of 8 quinine kills *Paramacium* at a dilution of 1 in 10,000, at a pH of 7 a concentration of 1 in 100,000 is required. In the latter case the quinine molecules are equally attracted in malaria to both tissues and parasites. In the former the parasites (or *Paramacium* in the experiments described) possesses a super-attraction for the quinine molecule. At a pH of 6 some drugs are very feeble in their action—a pH somewhere near that of normal liver tissue. Thus toxins absorbed *via* the portal system may be innocuous, whereas the same toxin may have great potency when given into the systemic circulation.

(3) Diffusibility through cell membranes. Thus quinine given 10 hours after the malarial rigor does not enter the red blood corpuscles and the salvarsan molecule does not diffuse through the choroid plexus.

What factors, then, determine the selective action of such drugs as are specific cures for certain infections? Such factors are concerned as—(a) The variations of pH in different body tissues. A drug will act best in such tissues as possess its iso-electric potential. (b) Optical activity. Dextro and lævo-rotatory forms of the same substance may act differently. Thus emetine is a specific cure for amoebic dysentery; its isomer iso-emetine is useless. (c) Conditions in the substrate in which it acts. Alkaloids need an alkaline pH; amines have each their own optimum iso-electric point; ionizable drugs need an acid substrate (thus salicylic acid acts well in rheumatism in the acid environment produced by the *streptococcus* which is the causative micro-organism of acute rheumatism). (d) Their diffusibility through cell membranes in order to reach intracellular parasites, such as *L. donovani*.

As examples of such conditions, emetine acts ten times more powerfully if the acidity of the gut, which usually has a pH of about 6.2 in amoebic dysentery, be reduced or rendered alkaline to a pH of 8, when cure is occurring and the stools are returning to normal. Quinine acts well in malignant tertian malarial infections, but is not nearly as efficacious in benign tertian and quartan infections. Its maximal concentration in the portal vessels coincides with the site of intensive multiplication of the parasites. In benign tertian and quartan infections the parasites also multiply in the peripheral blood stream, where the quinine concentration is less. With ionizable drugs the liver often converts such metals to a colloidal state.

In the light of our present knowledge then, we must regard cures in such diseases as purely chance effects. Our want of therapeutic success is due to incomplete knowledge and to an ignorance of the minute biochemical changes occurring in the tissues.

To take the case of quinine administration in malaria for example—After the oral administration of one gramme of quinine the concentration of the drug in the blood attains a dilution of from 1 in 133,000 to 1 in 250,000. It is estimated that each red blood corpuscle has adsorbed upon its surface twenty million molecules of quinine. But even this means working in concentrations sublethal to the malarial parasite. In fact quinine appears to kill malarial parasites only during the periods when they are extracellular and still applied to the surface of the red blood corpuscles. Once the parasite has entered the red blood corpuscle it is within a quinine-free area, and schizogony can proceed undisturbed. If so, theoretical calculations from the number of merozoites produced by those schizonts not affected by quinine shews that if quinine destroyed

99 per cent. of all parasites present, a continuous 27-day course of treatment would be required to sterilize a patient from a malignant tertian infection.

Again motile organisms may actively avoid areas and tissues of maximal drug concentration thus *Paramecium* moves away from a quinine-laden environment. Spirochaetes and trypanosomes in the cerebro-spinal fluid are protected against the action of drugs in the blood stream. The pleural and peritoneal cavities are also probably drug-free areas for parasites.

In such drugs as have to be used in concentrations sublethal to the parasites which they destroy, as in quinine in malaria, destruction of parasites is a fractional process a proportion of each brood being destroyed by the drug and therefore, treatment must be continuous especially with drugs such as quinine, which are rapidly excreted. With drugs which tend to cumulation, however, and slow excretion, treatment must be discontinuous, e.g. antimony and arsenic. There is scarcely any tropical disease of which it may at present be said that we know the actual courses of treatment needed to cure. The value of experimental work upon patients removed from infective areas to places where re-infection was impossible should be realised thus experimental work on the quinine question in malaria should be undertaken on patients removed to hill stations, where all possibilities of re-infection can be excluded.

In the action of these selective and specific drugs how does death of the parasites occur? —

(1) It may occur by starvation of the parasite. In amoebic dysentery emetine in the concentration present in the gut or tissues has no direct action upon *Entamoeba histolytica* but it is believed that it so alters the red blood corpuscles and tissue fluids upon which *E. histolytica* feeds that these are rendered unpalatable to the parasites, which, accordingly, die out from starvation.

(2) It may reduce the natural rate of multiplication of the parasites—as in quinine and malaria—to such an extent that the natural powers of body resistance or other factors present exterminate the infection.

(3) In protozoal infections are there in reality such forms as drug-resistant strains? The question of immunity in protozoal diseases is very little, if at all, understood. Protozoa shew much variation in the powers of resistance of individuals to adverse environment, but little evidence of the development of hereditarily transmitted and acquired resistance. Thus whatever the course of quinine treatment in the benign tertian malarial cases studied at Dagshai—whether a 10-day intensive, a 30-day intermediate or a three months' prolonged course was given—some 20 per cent. were cured without relapse but 80 per cent. relapsed and relapse seemed to bear no relationship to any development of possible quinine-resistant forms. The entry of the parasites into safe, drug-free areas may account for the so-called "resistant" strains.

(4) Should the site of most intensive parasite multiplication coincide with the tissue presenting the optimum pH for the activity of the drug, its efficacy will be maximal. Metallic compounds—such as the salts of antimony—tend to dissociate in the liver.

The mode of administration of these drugs is important. Thus Unguent Hydrarg. Ammon. dil. is almost a specific cure for *impetigo contagiosa*. In this infection the causative septic cocci produce an acid environment, mercury is liberated in ionized form and kills the cocci. Quinine hydrochloride is very rapidly absorbed from an empty stomach but is much less diffusible when taken just after a meal. In intramuscular injections of the cinchona alkaloids local necrosis and hæmorrhage occur whatever the salt injected the quinine is all locally precipitated as quinine base thereafter some of it is slowly absorbed into the circulation. In intravenous therapy alkaloids should be administered as bases since injection of their acid salts is liable to cause hæmolysis of the red blood corpuscles, protein shock and rigors. Amines however

should be administered as acids, since they then act better.

The ideal specific drug for any infection should possess the following properties —

(i) It should effectively destroy the micro-organisms responsible for the disease at a concentration which is non-lethal to the human host.

(ii) It should have a high rate of diffusion into tissues and body fluids.

(iii) The site of maximal concentration of the drug in the body tissues after administration should coincide with the site of maximal intensity of multiplication of the causative agent of the disease.

(iv) The hydrogen ion concentration of the site in which the causative micro-organisms of the disease multiply most actively should be one in which the drug is most active.

In the discussion on Major Acton's paper Professor C. V. Rama said that he congratulated Major Acton upon a most thoughtful and original paper. It was clear that enquiry upon these lines might lead to vastly improved knowledge. He disagreed however, with Major Acton's use of the term "gravitational" the author appeared to mean electromotive force and magnetic attraction rather than to be referring to gravity. Dr Panchanan Neogi, speaking as a scientific chemist said that the term $\text{cH} = \text{hydrogen ion concentration}$ seemed more accurate than $\text{pH} = \text{potential of hydrogen ion concentration}$. The terms iso-electric and ampholytic also appeared to be very loosely used. Medical men had brought prominently before chemists the importance of the study of ionization. Major T. C. Boyd I.M.S., said that to-day we badly needed the irruption into medicine of pure chemists and scientific physicists. When faced with medical problems their point of view would certainly be original and refreshingly novel and useful. But could the pH of the liver *in vitro*, for example be taken as identical with its pH *in vivo*? Deductions from *in vitro* work must be supplemented by experimental observations *in vivo*. Dr L. E. Napier considered that Major Acton's paper shed a new light upon the old-fashioned views as to the administration of drugs "before or after meals". In olden days drug administration went by the phases of the moon to-day it was governed by the pH. Major R. N. Chopra, I.M.S. congratulated Major Acton upon his valuable contribution towards the study of a most difficult subject. Major R. Knowles I.M.S., commented upon the apparent extraordinary difference in action of emetine upon *E. histolytica* and upon *Iodamoeba butschlii*. Major Acton's paper lent useful information as to one point in malaria. Every one was agreed that the malarial parasites were extracellular and applied only upon the surface of the red blood corpuscles during part, even during a considerable portion, of their life cycle. But the evidence in favour of the fractional destruction of the parasites by quinine lent support to the orthodox view that, during their later phases, and during schizogony at least, the malarial parasites were truly intracellular, within the red blood corpuscle envelope, and thus sheltered in a quinine-free area. Dr U. N. Brahmachari asked whether these views would explain the action of anaesthetics. Here questions of fat solubility and surface tension seemed concerned. Yet if fat solubility were the principal factor concerned, anaesthetics should act, not only upon the central nervous system, but also upon the peripheral nerves and even upon the red blood corpuscles. Secondly would these views explain certain differences in the action of some drugs towards certain protozoa? Pentavalent antimony has no effect upon *Leishmania* infections unless administered as an amino compound trivalent antimony is far more active.

In replying, Major Acton commented upon the misuse of scientific terms by medical workers. He had adopted "gravitational" from Einstein but Professor Rama was right. A present study of the mechanism of spontaneous cure in malaria was now being undertaken at the Calcutta School of Tropical Medicine and promised to yield results of much value. Toxicity and

dissociation of compounds were possibly correlated. Thus rapid ionization of antimony and of other metallic compounds in the liver might lead to their becoming unexpectedly toxic.

Railway Medical and Sanitary Problems

THE opportunity of conferring on the medical and sanitary affairs of the railways of India, Assam and Burma has again been taken advantage of by the members of the Railways' Chief Medical Officers' Conference which held its third session at Calcutta under the presidency of Dr H G Waters, Chief Medical Officer of the East Indian Railway, in October 1922.

In welcoming the members of the Conference Dr Waters had satisfactory progress to report in regard to matters put forward at the last Conference held at Allahabad. Suggestions for improving water supplies to passengers, for remodelling back-to-back menial staff quarters, and certain recommendations in regard to sanitary arrangements in Third Class carriages, reciprocation between the medical establishments of the different railways and means by which the quality of the food sold to passengers might be ensured had gone forward and were either approved of or under consideration. Much of the work of the Conference is done by informal discussion, but opportunities for visiting places of special interest from the Railway Medical Official's point of view are welcomed, and visits were paid to the East Indian Railway Carriage and Wagon shops at Lillooah, the Calcutta School of Tropical Medicine, and, by permission of Messrs Bird & Co., to the Lawrence Jute Mill. These visits afforded members the chance of seeing the experimental pattern Indian latrine which the East Indian Railway propose to provide for first and second-class coaching stock, the many departments of the School of Tropical Medicine and especially the work of Major Acton in determining the causative relationship between infected rice and epidemic dropsy, and of becoming acquainted with the facilities afforded by the School for post-graduate work especially applicable to railway medical staff, of which due advantage will be taken. The excellent manner in which the sanitary problems of a large concentrated labour community had been solved at the Lawrence Mill was appreciated. The many subjects which came up for discussion during the four days' session included the chlorination of water supplies (it was generally agreed that this method of purification had no deleterious effect on engine boilers), the zinc iodide-and-starch method of testing chlorination efficiency, preservation of bleaching powder by the addition of quick-lime, the introduction of facilities for anti-rabic treatment into railway colonies and methods of economising particularly in regard to the cost of drugs and dressings.

The Conference terminated with a dinner held at the Bengal Club at which the speeches dealt with the importance of the work of railway medical staffs and the true economy of preventing disease amongst railway workers by the provision of healthy conditions of life and efficient treatment for the sick.

Dr H G Waters was re-elected President of the Conference for the ensuing year and the recommendation to meet in Bombay for the 1923 Conference was approved.

Midwifery Notes, 1922.

By FLEMING GOW,

CAPTAIN I M S,

Eden Hospital, Calcutta

IN India in the domain of midwifery neither of the new American methods of eliminating the second stage of labour has found favour. J W Potter aims at accomplishing this by version in all cases, whether primipara or multipara, at the end of the first stage and before any interference is imperative, and though he

has attained a measure of success, his treatment has evoked much adverse criticism.

J B de Lee of Chicago's "prophylactic forceps and perineotomy," consisting in the delivery of the child in vertex presentation as soon as the head rests on the pelvic floor and the early removal of the placenta, merits that operator's own criticism of "meddlesome midwifery." The difficulties of securing a competent anaesthetist in India, where the administration of anaesthetics remains untaught, and of giving gas and oxygen or ether anaesthesia are against the method receiving a practical trial even in hospital practice.

On the other hand the research work of Major H W Acton, I M S, into the action of quinine and the allied alkaloids on the pregnant uterus has recently been practically applied in India to lessen alike the maternal morbidity and foetal mortality in cases of post-maturity and of dry labour. As soon as the 280th day of gestation has been completed there is no risk in inducing labour by the administration of castor oil $\frac{1}{2}$ ozs followed by a hot enema at 116°F, and three doses of quinine hydrochloride gr $\frac{1}{2}$ at half-hour intervals, nor will labour be delayed and protracted if the cervix is previously opened up by the insertion of a gloved finger. The value of this treatment in dry labour lies in the increase of the tone and the rhythm of the uterine contractions and by cutting short protracted duration of the pains, thereby lessening the frequency and necessity for operative termination.

The reports presented to the British Congress of Obstetrics and Gynecology at Liverpool have revolutionised the treatment of eclampsia in India as well as at home. The old view that eclampsia was a desperate illness requiring heroic treatment, drastic purgation and even accouchement forcé has been superseded by the modern view that it is best treated by simple medical measures and with the minimum of obstetric interference. The report clearly demonstrates that the eclampsia met with in hospital practice in Bengal is of a much more "severe" type than at home, while the "mild" cases which form three-fifths of the total at home are scarcely known here. The high mortality figures for Bengal are largely due to the ignorance of the masses, for, although 80 per cent of cases have premonitory symptoms, practically none seek the all-important prophylactic treatment which women at home receive at the hospital out-door department and at the ante-natal clinic.

The recent adoption of the principles enunciated by Stroganoff and Hastings Tweedy—the exhibition of morphia and chloral, thorough stomach and colon lavage, but no drastic purgation and the minimum of obstetric interference—heralds the dawn of a brighter day for India and a reduction of the mortality amongst its long suffering women.

Referred Pain.

By OTTO V HUFFMAN, M B

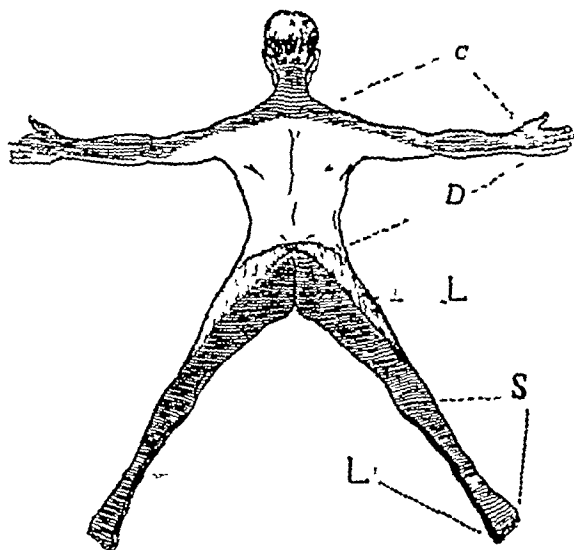
American Journal of Surgery February 1922

ALL visceral pain is referred, as there are no sensory neurones in the viscera. Stretching of the retro-peritoneal tissues gives rise to pain as there are some sensory fibres in them. So, if the viscera are pulled upon, retro-peritoneal tissue pain is at once felt. The pain of abdominal colic is largely due to the stretching of the retro-peritoneal tissue, including that between the layers of the mesentery or meso-appendix. But the viscera are abundantly supplied by neurones from the sympathetic nervous system and this explains the pain felt on injury to or disease of the internal organs. The author comments on the possibility of synapses existing between the sympathetic neurones and the sensory ones supplying the skin and also of the connection between the sympathetic neurones and the other neurones of the spinal cord *via* rami communicantes. A state of hypertonicity is developed in the visceral neurone, which, through its synapses irritates the neurones with which it comes in contact. These being

usually the sensory neurones in the posterior nerve root ganglia their irritation gives rise to pain which is referred to their peripheral distribution.

In the case of a gastric ulcer the sympathetic neurone irritates an afferent neurone and this gives rise to a sensation which is referred to the part of the body supplied, either the surface or deep muscle, and the peripheral end of this afferent nerve becomes tender. The stomach and the ulcer may be moved about by deep diaphragmatic breathing, dilatation, etc. but the point of tenderness does not move. Likewise the sympathetic neurone has its high state of irritability referred to motor neurones located in the cord, and these when thus irritated cause a hypertonicity in the muscles which they supply that is, rigidity.

Again if one considers "the upper extremities as having budded out from the body carrying part of the first cervical and part of the first thoracic segments



C (Shaded) Cervical segmental distribution In the case of a lesion in the apex of a lung, at the aortic orifice in the liver or in the stomach pain, tenderness or paresthetic sensations may be experienced in this area either on one or both sides.

D (Unshaded) Thoracic segmental distribution to postero-lateral aspect of the upper extremity and of all of the thorax and the abdomen. Beginning at the top the following viscera are related to the successive dermatomes but as they overlap it is sufficient to bear in mind the general successive relation: the heart (ventricles), aortic arch, lungs, heart (auricles), prostate, kidneys, uterus (body contraction), testicle, ovary, oviducts and bladder (contraction).

L (Vertical shading) Lumbar segmental distribution to the postero-lateral aspect of the hip, the anterior aspect of the lower extremity and the inner aspect of the foot. The following viscera are related to this area: the kidneys, urethra, bladder, oviducts, epididymis, vas deferens, part of the prostate and the lower colon.

S (Horizontal shading) Sacral segmental distribution to the posterior aspect of the lower extremity including the sole of the foot except the inner aspect. These organs are related: the prostate, bladder, rectum and cervix. (Related Visceral Sensibility from Dejerine.)

along with them," and keeps in mind that the heart is connected with some of the upper thoracic segments, it will be clear why part of the arm supplied by these segments is frequently the seat of referred pain in cardiac disease.

These segmental areas ("dermatomes") incline downward in front and this explains why the pain of pleurisy is often referred to the abdomen and simulates appendicitis. In considering the cause of any pain one should always remember the viscera related to the same segmental area. Some of the post-operative pains in the back and extremities are believed to be referred visceral pains and not due to the posture maintained whilst on the operating table. The diagram and note

above illustrating the paper clearly show these segmental distributions and will help the reader in remembering them.

A Synopsis of Adult Oriental Culicine (including Megarhine and Sabethine) Mosquitoes

By F W EDWARDS

Part I Indian Journal of Medical Research July 1922

THIS important paper is (1) the last word in the classification by genera of the Culicines (including Megarhines and Sabethines) of the world, and (2) supplies a key to the Oriental species of the genera *Aedes*, *Lutzia* and *Culex* (including those of Japan and Formosa which are of Oriental type rather than Palearctic as is the mass of the fauna of these countries). Further papers will supply the key to the species of the remaining genera.

The author does not disguise the fact that further research may necessitate further revision of the generic grouping though to date his study has been so exhaustive and his view so comprehensive that his attempt "to attain the humane objects of a zoological classification which are to knit together the morphological bonds that should unite diversely modified relatives" (in Colonel Alcock's picturesque language) seems to have enabled him to present us with a truer picture than that drawn by any previous worker.

It is certainly a step in advance that the classification of the genera is not based on female characters only but on those of both sexes—for instance neither the female palps nor the female genitalia supply the sole definitive characters; the male genitalia however are ruled out of court on the ground of instability and inconvenience with the latter point of view the medical student will sympathise, though from the biological standpoint the study of this aspect of the subject is of great interest.

On the other hand it is regrettable that oval and larval characters do not appear to aid the author's deliberations. *Anopheles kochi* and *A. tessellatus* in the adult stage are two very distinct species, so distinct as to have been included under two genera, though a study of their oval and larval characters proclaim their very close affinity.

If the author has been obliged to sink such generic names as *Stegomyia* under that of *Aedes* it is because no definitive character can be found to differentiate the species which were included under those genera. If some entomologists "have broken the 'Culicales' to pieces like a potter's vessel," the author has mended it with much magic.

Bags versus Expectancy in Dry Labour

By FRANKLIN A DORMAN, M.D.

New York State Journal of Medicine Vol 22 No 3 March 1922

IN this paper the author gives extracts from standard text-books and quotes statistics of both hospital cases and his own private cases, summarises them and draws conclusions with a view to intelligently discussing the treatment of dry labour. The maternal consequences of dry labour are "a liability to protracted and more painful labour with tetanoid ineffective pains, and probable infection with possible laceration of the cervix, exhaustion, rupture of the uterus, vagina, pelvic floor or perineum, fistulae, postpartum hemorrhage or even pulmonary thrombosis, and the more frequent need for operative delivery. As to the child, there is the increased likelihood of asphyxia, intracranial hemorrhage or death from pressure on the cord or cerebrum."

From a consideration of the histories of 270 cases of prematurely ruptured membranes in women with viable infants in which the rupture occurred at least twelve hours before delivery the conclusion is drawn that "the length of time that the uterus is drained

is a negligible factor in the causation of morbidity or mortality, but the length of labour is an important reason for both complications," and further dry labours require operative termination in one-third of the births, and the risks of breech labour are much greater if the membranes are ruptured early. Cæsarean section was done in eight cases and gave no maternal deaths and but one foetal death in a case of ruptured uterus, and the inference is drawn that a drained uterus, even if existing for many hours, does not necessarily contraindicate this method of delivery.

As to the use of bags the author's statistics show that in dry labour the bag, even when employed to induce labour, does not reduce morbidity and seems unfavourable to the foetus. "In cases with ruptured membranes, not in labour, it would seem that expectancy is the safer course. This rule of conduct should be qualified by insistence on the avoidance of vaginal contamination by coitus, tub baths, douches, or examination. Such cases should be under supervision in the hospital, if possible. The patient, if under control, can then be trusted to wait until the onset of spontaneous labour. It is believed that such a labour will be of a more normal type, and that the death of the child *in utero* from pressure before labour is extremely improbable.

It goes without saying that if the conditions indicate a Cæsarean section there is no argument for waiting for the onset of pains.

If the patient be in active dry labour, the value of expectancy is not always as clear and in certain few cases where irregular action of the uterus with very slow dilatation exists, the bag may expedite delivery especially as we recall that puerperal morbidity and foetal mortality are in relation to the length of labour. It is well, however, in these cases, to be sure that there is not some other complication which may compel resort to the Cæsarean operation.

Inasmuch as the infant in breech labours seems to tolerate dry labour poorly, the occasional resort to the bag may here serve a useful purpose.

Finally, dry labour should be so guided that, if protracted, the mother's strength be mercifully conserved, by the use of morphine and nitrous oxide gas, by the employment of cervical incisions or manual stretching for incomplete terminal dilatations, and by such assistance in the second stage as may be clearly indicated."

Cæsarean Section—Indications and Contra-indications.

By JAMES KNIGHT QUIGLEY, M.D.,
New York State Journal of Medicine Vol 22, No 3
March 1922

THIS is a brief review of the indications and contra-indications for Cæsarean section. In cases of minor degrees of pelvic contraction if it seems that delivery *per vias naturales* is only to be brought about by the application of forceps to an unengaged and unmodelled head, and if the case is not already infected, Cæsarean section, according to the author, is the method of choice. This method of delivery is also advised in all cases of central placenta prævia with undilated os, patient in a good condition, and baby living, and in marginal or lateral cases in a primipara with rigid cervix and baby living. Stenosis of the cervix after amputation, carcinoma of the cervix, ovarian cysts and other pelvic tumours, if the growth cannot be brought upwards, are other possible indications. The author does not feel that there is "a very wide field for the employment of Cæsarean section in eclampsia. The case with an undilated rigid cervix as in an elderly primipara, which is not responding to eliminative treatment is probably best delivered by this method but with the great majority of cases I would prefer eliminative treatment intensively carried out, morphine and induction of labour the patient with a grave toxæmia,

especially if she has water-logged tissues, is a poor risk for any laparotomy. Eclampsics stand shock poorly. Post-operative inactivity of the bowels militates against elimination by free catharsis."

In cases of elderly primipara this method is only advised if the patient has a borderline type of pelvis. For subsequent pregnancies the patient might be allowed to go into labour provided she is in a well equipped hospital and there was no post-operative evidence of infection during the previous delivery and provided that delivery was not done for contracted pelvis. As regards indications relating to the passenger the author remarks as follows—

"*Over-size* or disproportion in a pelvis not showing contraction but due to either a large head or its inability to mould from extreme ossification of the cranial vault as shown by a test of labour, these cases are often *over-term*, an attempt to deliver these by high forceps is almost surely to result in the death of the foetus and more or less injury to the pelvic floor with its unfortunate consequences. If this occurs in a multipara and the disproportion is not too great, good results will follow version but I do not believe this choice should be made with primipara. Threatened asphyxia as shown by the condition of the foetal heart and possibly by the passage of meconium, where rapid pelvic delivery is contraindicated.

Malpresentation—As in locked twins, breech or face, also occiput posterior in a primipara, if accompanied by pelvic disproportion, otherwise not. While bad results may rarely follow from pelvic delivery in a persistent occiput posterior, nevertheless this does not justify the selection of Cæsarean section for this indication alone."

With regard to contra-indications the author's observation is as follows—

"*Exhaustion*—A patient with all the evidence of general physical exhaustion including a rapid pulse is a poor risk and is prone to postpartum hæmorrhage. *In case the child is known* to be dead, with possibly two exceptions exclusive of the absolute indication (of an internal conjugate of 5 cm or under), *viz* placenta prævia centralis or ablatio placentæ where it is felt the time saved in a rapid delivery may be the deciding factor in saving the mother. *In case of monstrosity* if diagnosed. *In the presence of known infection*. This naturally presents the question what constitutes infection. Repeated vaginal examinations through an unprepared vulva especially if made by one of questionable technique, membranes long ruptured, previous attempts at pelvic delivery or the use of bags, forceps or attempted version.

The extraperitoneal operation was thought to nullify all these rules against the classical section but after a trial of a few years one or two clinics admit that infection is as common post-operative and its results not ideal."

But personally he would consider abdominal delivery contra-indicated unless the indication is absolute and then he would do hysterectomy after section.

Relation of Faulty Cultures to Diphtheria Mortality.

By E. S. O'KEEFE, M.D.,

Boston Medical and Surgical Journal,
4th May 1922, p 603

THIS short and useful paper comments on the causes of diphtheria mortality under present-day conditions of treatment. Among the causes commonly responsible for death in acute diphtheria the author mentions (a) delay in sending for a physician, (b) inadequate dosage of antitoxin, and (c) failure to recognise the condition. He points out that a negative laboratory finding does not necessarily exclude diphtheria. Kolmer is quoted as stating that 20 per cent. of primary cultures fail to shew diphtheria, where a second swab shews the organism. Here what is important is to

secure material not from the surface of the membrane but from beneath it. Taken as a whole diagnosis by culture is more reliable than diagnosis from a stained slide. On the other hand the direct films from the swab may occasionally shew non-viable Klebs Löffler bacilli which fail to grow on serum agar. In all cases the mere suspicion of diphtheria should be sufficient to call for full antitoxin administration without awaiting the results of laboratory examination.

The Pernicious Vomiting of Pregnancy.

By CARLTON OLDFIELD, MD, FRCS,
British Medical Journal 20th May 1922, p 789

DR. OLDFIELD considers that the pernicious vomiting of pregnancy is essentially a neurosis, and treats it accordingly. The patient is removed from home and put into a separate ward in a hospital or in a nursing home. No encouragement is given to her to consider her condition serious, and no bowl is provided. She is expected to immediately eat an ordinary mixed meal, and not infrequently—to her own surprise—does so without harm. That there are metabolic disturbances and toxic symptoms in connection with the complaint he readily admits but classifies them as its sequelæ and not as its causes. Induction of abortion—the desire for which is indeed in some cases the actual cause of the neurosis—he finds to be seldom or never necessary. One of his patients who was in an apparently critical state on admission, put away a meal of tea, bread and butter and stewed apple and followed this up by a breakfast the next day of bacon and eggs. In ten days she was perfectly fit and emesis had never occurred during the period of observation.

The Reaction of the Blood in Relation to Dyspnoea.

By F R FRASER, J P ROSS, AND N B DREYER,
Quarterly Journal of Medicine,
April 1922, p 195

THE authors adopted the method of Dale and Evans for determining the pH content of the blood and determined the reaction in eleven normal male adults, nine patients with signs of severe circulatory failure, and seven with signs of severe renal disease. Arterial blood was obtained from the radial artery and venous from the elbow veins without constriction. The glassware used was given prolonged treatment to free it from all traces of alkalinity. Normal blood gave reactions of from pH 7.72 to 7.64 with a mean at 7.68, and the reaction of venous blood was much the same as that of arterial blood. In cases of heart failure the blood became more alkaline than normal, one reading as high as 7.95 being obtained. The cases of renal failure gave readings of from 7.36 to 7.73 and shewed a condition of acidæmia. Sometimes even severe acidæmia was present without dyspnoea. Dyspnoea was found to be associated with alkalæmia as well as with acidæmia. Reactions of arterial blood as alkaline as pH = 7.95 and as acid as pH = 7.37 were found to be compatible with life thus illustrating the variations of compensatory mechanism within which the bodily functions are still able to carry on.

Complement Fixation in Hydatid Disease

By N H FAIRLEY,
Quarterly Journal of Medicine,
April 1922, p 244

This paper will be of interest to many workers in the tropics. In cases of hydatid infection a specific antibody is evolved in the blood in response to the

absorption of specific antigen from the *T. echinococcus* cysts. If inactivated serum containing such antibody is mixed with hydatid antigen in the presence of complement for one hour at 37°C, the complement is so combined that it can no longer be demonstrated in the mixture. The author uses a method in which minimal quantities of fluids and reagents are employed. In obtaining the antigen the livers and lungs of infected sheep are brought direct from the abattoirs to the laboratory, the cyst wall touched with pure carbolic acid, and the fluid inside aspirated and stored on ice being finally filtered through filter paper before use. Saline or alcoholic antigens were also prepared from well washed scolices. Whatever the antigen used it must be prepared from material containing scolices. In the test 3, 4½ and 6 minimum hæmolytic doses of complement are used.

In the author's hands the test proved absolutely specific. Of 83 cases 70 yielded a positive result. Of 917 controls in which there were no clinical signs of hydatid disease, but which included syphilitic cases and patients with other helminthic infections, the reaction was negative. A small minority of hydatid cases gave negative findings but here the factors at work appear to be either deficiency in antigenic properties of the fluid absorbed from the cysts, or lack of absorption of the hydatid antigen through the adventitia. Such complications as partial or complete rupture of the cysts and operative interference lead to a transient increase of antibody content. After operative drainage of the cyst quantitative titrations shewed a maximal production of antibody during the third or fourth week after operation followed by rapid diminution. Old standing suppuration in the cysts, or rupture with complete evacuation of cyst contents invariably lead to negative findings. During the first two decades of life the reaction is less definite than in the case of infected adults. Where persistent positive reactions are found for a year or longer the clinical findings shew active echinococcus infection which has by no means cleared.

The author notes that cerebro-spinal fluid failed to give a positive result in the hands of other workers. He has not himself had an opportunity of testing the technique in a case of suspected CNS infection. The sera or fluids used for the test must be clear and blood serum, pleural fluid or peritoneal exudate should be diluted with four times the volume of normal saline—in the case of serum the complement being removed by 20 minutes' heating at 55°C. Sheep antigen gave a more intense reading than did antigen prepared from human hydatid cysts.

Laboratory workers should refer to the original paper. The test in the hands of Dr Fairley may be said to be now standardised and efficient. Above all it appears to be free from that bugbear of all complement fixation tests, the giving of a positive reaction with syphilitic sera. Until we know the nature of complement and its deflection such tests are always open to doubt but in the case of hydatid and bilharzia infections recent work seems to have established a very clear claim to their specific value in diagnosis and hence also in prognosis, since the ultimate drop in titre indicates eradication of the infection but a persistence of the reaction that the infection is still active within the tissues.

Aspiration in Amoebic Abscess of the Liver.

RECENT correspondence in the *Journal of Tropical Medicine and Hygiene* indicates that opinion is not yet unanimous as to whether aspiration should or should not be resorted to in cases of large or considerably large amoebic abscess of the liver, placed under emetine treatment. In the number for March the 1st, 1922, Dr V S Hodson of Khartoum urges that emetine treatment is *per se* efficacious, without aspiration. "So long as the amoebæ are alive and active the direction of circulatory flow is centripetal but as soon as the amoebæ are killed by emetine the main direction of

flow becomes centrifugal, and once this centrifugal flow has set in there is nothing to prevent its continuance, and absorption, in my experience, is a matter of great rapidity." There is usually no limiting membrane to a liver abscess and sterile pus is rapidly absorbed. It would be of interest to have facts and figures given for and against aspiration as an accessory to emetine treatment. Also to know whether any "backwoods-men" are still faithful to open operation.

Alastrim or Kaffir Milk Pox.

By L. M. MOODY, M.D., B.S., M.R.C.P.,

Annals of Tropical Medicine and Parasitology,
March 31st, 1922, p. 21

DR MOODY, Government Bacteriologist, Kingston, Jamaica, gives an excellent *resumé* of this disease, as studied from 2,912 cases seen at the Isolation Hospital, Kingston. In a few cases where the incubation period could be accurately determined it varied from 10 to 14 days. The symptoms of onset were sudden fever, intense headache, backache, pain in the limbs, and occasionally vomiting. The rash appears about the third or fourth day after the onset of symptoms, and the temperature then falls—the patient becoming quite comfortable. The rash appears first especially on the face, the lower half of the back, and the arm and forearm, especially on the wrists. Mucous membranes such as those of the mouth, larynx and genitalia are affected. On the neck, the upper part of the trunk and abdomen, the inner side of the thighs and the circumorbital area the rash is less defined or even absent. The vesicles finally become dome-shaped and shotty to the touch. Resorption of fluid commences about the eighth day, and the temperature may rise again in later septic infection of the vesicles. Broncho-pneumonia was the most troublesome complication. The mortality rate was only 4.5 per 1,000.

The virus passes through the placenta. Of eight cases of abortion at about the sixth month from infected mothers all the foetuses showed signs of the disease. In addition two living children were born with the disease on them. In the abortion cases the Wassermann reaction was negative and no spirochaetes could be detected.

Vaccination appears to provide very considerable protection. In alastrim convalescents 45 took, when vaccinated, out of 60. The course of the vaccination however was not normal. The lesions developed slowly, the vesicles were of small size and imperfectly umbilicated, both local and constitutional symptoms were insignificant, and the resultant scar was not depressed or pitted.

The author concludes that alastrim and vaccinia belong to the same group of diseases, but present individual differences, the one disease affording almost complete immunity against the other.

The paper is followed by a most beautiful set of photographs illustrating every phase of the disease.

The Excretion of Quinine by Soldiers in Macedonia.

By T. S. HELE

CAPTAIN, R.A.M.C. (T.F.),

Journal of the Royal Army Medical Corps,
April 1922, p. 251

CAPTAIN HELE concludes that the picric acid method for quinine estimation in the urine as introduced by Klein and modified by Ferrey is accurate and applicable when laboratory facilities are limited. The technique is as follows:—Two hundred cubic centimetres of urine are acidified with a few drops of dilute sulphuric acid and boiled. One to 15 grammes of dry picric acid are added to the hot mixture and stirred in. The whole is allowed to stand at least for one hour, with occasional stirring. The liquid is then filtered through

a filter paper of diameter not larger than 4½ inches, till the filtrate comes through clear. The filtrate must give no precipitate with a saturated aqueous solution of picric acid. The precipitate and filter paper are transferred without washing to an Erlenmeyer flask, fifty cubic centimetres of three per cent caustic soda added and the whole heated on the water-bath for half an hour with occasional shaking of the contents. The flask is cooled, and the contents are transferred to a separating funnel, and extracted three times with fifty cubic centimetres of chloroform. The chloroform extract is collected in a flask, and the chloroform is distilled off. The residue is redissolved in dilute sulphuric acid. The solution is transferred to a separating funnel, is extracted twice with chloroform to remove pigment, is then rendered alkaline with three per cent caustic soda and shaken out three times with chloroform. The three chloroform extracts are run into a tared flask, the chloroform is distilled off, the flask dried at 120°C, to constant weight and weighed. The residue is quinine, together with any other alkaloids present in the urine.

For faces a combination of the Stas-Otto and the picric acid methods was used. The excretion in health, in malaria and in blackwater-fever, and after different methods of quinine administration was studied. The results obtained are summarised as follows:—

"(1) The picric acid method for estimating quinine is sufficiently accurate for a clinical laboratory. It can be used with advantage when the apparatus is limited.

(2) In health quinine is eliminated more rapidly after oral than after intramuscular administration (one case).

(3) The excretion rate of quinine in health shows no great fall from the second to the twelfth hour after an oral dose, from the fourth to the eighteenth hour after an intramuscular dose, and from the second to the twelfth hour after an intravenous dose. It is suggested that the quinine concentration in the blood is relatively constant over the same periods (one case). The excretion rate of quinine falls off rapidly after the first day. Elimination may continue for ninety-six hours.

(4) The excretion rate of quinine in malaria is similar to that in health, but there is greater variation, as would be expected, after oral administration.

(5) In cases of malaria the excretion of quinine shows individual variations, but in the series quoted there is no constant difference observed under different forms of therapy. The amount recovered from the urine varied from ten to thirty per cent of the administered dose.

(6) There is no evidence of any decrease of quinine elimination during a course of treatment.

(7) The excretion of quinine in five cases of blackwater-fever was only a little less than normal. In a sixth case the excretion of quinine was less than half the normal. All these cases were passing a fair volume of urine and recovered.

In a seventh case where there was suppression of urine for three days only traces of quinine were found in the urine removed from the bladder post-mortem. There were forty milligrammes of quinine in the liver of this case.

(8) The faeces of all cases given in this report were examined for quinine. Only traces were detected."

The Excretion of Potassium Iodide in the Urine in Health and Disease.

By G. C. LINDER,

Quarterly Journal of Medicine,
April 1922, p. 227

OF the introduction of tests for renal activity there seems to be no end. The Potass. Iodide method, however, is one which appears to be simple and reliable. A standard dose of two grammes of the iodide was

given to all patients investigated and Trevan's method for estimating the iodide content in the urine used. In this method the iodine is set free with fuming nitric acid, extracted with chloroform, and the solution in chloroform is then titrated with sodium thiosulphate, using starch emulsion as an indicator. The author concludes that the iodide test is a reliable indication of nephritis when the excretion falls below 35 per cent. In certain cases of nephritis—illustrated by four cases of chronic mixed nephritis, acute tubular nephritis, arterio-sclerosis with chronic nephritis and chronic mixed nephritis with vomiting, the test gave fuller information as to diagnosis and prognosis than did such tests as the estimation of blood urea, the urea feeding test and the diastase content of the blood and urine. Should the excretion remain unimpaired throughout this is a sign of good prognosis of fair prognosis if the excretion recovers after being impaired and of bad prognosis if it remains indefinitely in the region of 25 per cent. A reduction of output to 15 per cent or less is a sign of the gravest prognostic importance. In some cases the iodide test indicates a less advanced stage of recovery than the clinical symptoms seem to indicate and is of value in treatment as well as in diagnosis. In a few of the cases examined there was a slight degree of iodism after administration of the dose given, but no sign of deleterious effect on the kidneys.

Some Observations on Gonorrhœa in the Navy, with an Analysis of 1,000 Consecutive Cases treated on Orthodox Lines

By SURGEON COMMANDERS P. M. RIVAZ
and

F. G. FITCH

Journal of the Royal Naval Medical Service,
April 1922, p. 117

To all intents and purposes the prevention and treatment of gonorrhœa is a more difficult problem than the prevention and treatment of syphilis. As the authors remark even acute, fresh cases rarely come to hospital until two or three days after infection has been definitely established. For acute cases the treatment adopted followed orthodox lines, at first anterior irrigations with 1 in 8,000 potass. permanganate, wearing a suspender, later posterior irrigations with from 1 in 6,000 to 1 in 3,000 permanganate solution, and finally, after the discharge has subsided, the use of zinc sulphocarbolate solution, gr. ii, aq. oz. i. After three weeks the patient is urethroscopied, prostate and vesicles examined, and rigorous bacteriological examinations conducted. Acute cases should not be subjected to instrumentation too soon, as this only tends to lacerate the inflamed mucous membrane and open up channels of infection. For chronic cases the most essential step is to localise the causative lesion by most careful examination. Submucous infiltrations and strictures are dilated with a Kollmann's straight dilator, prostatic and vesicular infections are treated by massage per rectum,—the bladder having first been filled with a 1 in 4,000 solution of mercury oxycyanide. Periurethral follicle which is described as one of the most intractable complications, is dealt with by local applications of silver nitrate through a urethroscope.

The authors are of opinion that the use of stock vaccine is to be recommended, especially in cases with arthritis and eye complications and in chronic gleet. The medium used for culture is trypticin-legumin-agar enriched whilst still fluid, with ten per cent. whole human blood and at a reaction of P_{H} 7. The doses given are from 50 to 500 million.

Three tables give the results of different orthodox lines of treatment in large numbers of cases and are of considerable interest. 245 cases, including 160 of fresh incidence, and 85 of relapse or chronic urethritis were

treated by irrigation only. The average stay in hospital was 40 days and only 4 were invalided. 268 cases were also treated with 'pallamine' (colloidal palladium), two 0.5 c.c. injections subcutaneously at 48 hour intervals, followed by a series of four doses of colloidal manganese intramuscularly in doses of from 0.5 to 2 c.c. These included 188 fresh infections and 80 of relapse or chronic urethritis. The average stay in hospital was 49 days and 3 were invalided. 487 cases, including 224 of fresh infection and 163 of relapse or of old standing were also treated with vaccines. The average stay in hospital was 46 days and 17 were invalided. This series however includes all the worst cases.

The authors' results shew that the efficient treatment of gonorrhœa is still a difficult problem. Too much instrumentation does more harm than good. To get the patient under treatment at the first possible moment is essential. Out of 672 first and fresh infections only 45 passed on to posterior urethritis and an additional 48 to epididymitis. Arthritis appeared in only 18 of these cases. On the other hand of 168 cases of chronic urethritis posterior infection was present in 31, epididymitis in 35, arthritis in 19 and 10 shewed definite stricture.

Not the least difficult part of treatment is the neurotic state into which many patients pass, and the authors consider that many men would do better if put on to a fair day's work and attending as out-patients, rather than when kept rigorously in hospital for some 46 days.

Pulmonary Embolism after Operations

By SIR C. GORDON-WATSON, F.R.C.S.,
The Practitioner June 1922, p. 381

SIR GORDON-WATSON draws attention to the apparent increase in massive pulmonary embolism in surgical statistics. Thus at St Bartholomew's Hospital, of 594 surgical post-mortems in 1912-14, 0.5 per cent. shewed this condition, of 638 similar cases from 1919-21, 1.7 per cent. shewed it. He has seen the condition in five cases within the past year. One was an excision of the breast, one a case of cholecystectomy, the thrombosis being found in the superior vena cava, one a case of fractured patella death occurring on the 14th day as the patient was descending in the lift with her leg in plaster on the way home discharged, one an appendicectomy operation and the other following operation for empyema. The age incidence is striking, and the great majority of cases occur in patients over the age of 45. In quite the majority of cases it is operations on the pelvic viscera which are concerned. Sepsis is not a prominent element in these cases with massive embolism of the pulmonary artery below its bifurcation. The author considers passive clotting in the large veins of the pelvis to be perhaps the most important etiological factor of all. Thrombokinase is not normally present in the circulating blood but trauma is probably an exceedingly important factor in causing its liberation from the damaged muscles, and the avoidance of all possible trauma essential in such operations. Classifying the factors concerned in pulmonary embolism the author considers that violent pre-operative purging, loss of fluid by sweating and hæmorrhage during operation, vomiting and limitation of fluids per rectum or orally are the main factors in causing loss of fluid. Blood pressure may become unduly depressed through post-operative shock, prolonged anaesthesia morphia injections before operation, recumbent fixed position after operation with a minimum of movement, and diminished respiratory efforts during convalescence. It seems reasonable to argue that, inasmuch as many or all of these factors are under the control of the surgeon, more can be done to avoid post-operative embolism than is usually at present the case. He advocates breathing exercises for abdominal cases and allows patients a good deal of freedom to move in bed, with early massage to the limbs and early permission to move about the ward. Posture during

operation may be almost as important a factor as trauma the high Trendelenburg and other cramped and fixed positions leading to venous stasis in the inferior vena cava and undue back pressure in the auricles. In brief to avoid all possible trauma, to avoid constrained positions during and after operation, and to stimulate respiratory and muscular efforts during convalescence may do much to lower the incidence of post-operative embolism. In the treatment of an actual attack strychnine is useless, and morphia injections and oxygen inhalations are indicated.

The Radical Cure of Hæmorrhoids.

By SIR JOHN O'CONNOR, KBE., MD,
British Medical Journal 13th May 1922

SIR JOHN O'CONNOR adheres faithfully to a modified Whitehead operation, which, in his opinion is the only operation on hæmorrhoids worthy of the name "radical". The primary dilatation of the sphincter he condemns as unnecessary and as disturbing anatomical relationships. The following is his brief and lucid account of his technique—

"1 Limit primary dilatation to the insertion of the right index finger in quest of concomitant polyp, ulcer, stricture, etc.

2 Apply a pressure forceps at junction of skin and mucous membrane to each of the four cardinal points of the anal circle.

3 With adjoining pairs of forceps held in opposing traction make a rapid dissection with a large, straight blunt-pointed scissors from "point" to "point" until the skin is completely detached from mucous layer.

4 Apply another pressure forceps to the cut edge of the latter between each of the four forceps originally placed. This makes the operator master of the situation.

5 Grasp the eight forceps in the palm of the left hand, insert the left index finger into the rectum, and then cut lightly all around with scissors until the external sphincter appears well in view.

It is absolutely essential at this juncture to define this muscle and keep it constantly in sight and pushed upwards, always remembering that all cutting must be done below and external to it.

6 Continue snipping round with scissors until the "Whitehead adit" (submucosa) is exposed, then bear Cunningham's *Anatomy* in mind. "The submucous coat is composed of loose areolar tissue, which allows of free movement of the mucous layer on the muscular coat, and which also admits, under certain abnormal conditions, of a prolapse of the mucous membrane through the anal orifice. The hæmorrhoidal plexus of veins is contained in this layer."

7 With the left index finger still retained in the rectum as guide, and the eight forceps in the left palm making traction, continue severance of the attachments to the muscular coat until the hæmorrhoidal cylinder can be peeled out of its bed by a few strokes of the back of scissors or other blunt dissector.

8 Then make a vertical slit in the protruded cuff up to the level of the "supra-Morgagnitic" circle, commence a continuous Triollet catgut suture at the apex of the slit, drawing the "red" mucous membrane into accurate apposition with the skin, then proceed, cutting transversely, half-inch by half-inch, at the level just mentioned, carry on, *pari passu*, the continuous suture stop and forceps every spurting vessel and ligate the same at once, so that at the last snip of the scissors nothing remains to be done except to complete the few final loops of the suture.

Abjure the employment of what is fatuously styled by clammers "a continuous hæmostatic suture," and of what is called by tinkers a soldering iron, in any part of the intestinal tract.

9 Having introduced a morphia suppository and a slender roll of dry gauze into the rectum, apply a dry gauze dressing and change the same daily.

10 On the fifth morning give the patient one ounce of castor oil, sponge the part after each evacuation with warm permanganate lotion, add a warm permanganate sitz bath daily, and re-apply a dry dressing.

11 On the seventh morning instruct the nurse to insert the right index finger (annointed) into the canal, and to educate the patient to do the same daily for two months. Do not forget, before he departs, to prescribe a pot of zinc and boracic ointment for this purpose. If any tags are in evidence on the ninth day apply a little eucaine and snip them off with scissors.

I have nothing further to state beyond the fact that not once in every fifty operations do I hear of any contraction or any other complication following this method. All the patients are discharged cured by the fourteenth day, and the time occupied in the actual operation varies from five to ten minutes."

Anatomy of Gonorrhœa in the Male.

By WILLIAM T BELFIELD, MD,

Journal of the American Medical Association
29th April 1922

THIS is a paper which should be consulted in the original by all interested in genito-urinary surgery. The author first deals with the types shewn in the evolution of the penis and shews the phylogenetic origin of the seminal vesicles. He notes the very great difference between gonococcus infection of the urethra and that of the seminal vesicles. In the first the mechanism of defence is potent there is profuse suppuration, no toxæmia, no antitoxin formation, no complement deviation. In brief there is every attempt at natural cure by an acutely inflamed mucous membrane. When the seminal vesicles are infected, however, the inflammatory response is slight, discharge may be shut up by closure of the ejaculatory duct by pus or fibrin, the complement deviation test becomes positive, and arthritis and other complications may ensue. The author is of opinion that the usual standard methods of attempting to deal with such vesiculitis are quite unsatisfactory and most methods of injection practised do not reach the vesicles. He estimates that in acute gonorrhœa the prostatic urethra is infected in some 70 to 80 per cent. of cases, the vesicles in a smaller percentage, and the epididymis in 10 per cent. Injection of the vasa deferentia is an improvement on ordinary methods and should be resorted to whenever rectal examination shews infection of the seminal vesicles. The procedure is a simple one the vasa being punctured and injected with collargol solution, thus distending and dilating the stagnant sacs with antiseptic. A skragram shews the distended condition. Of 83 cases of acute gonorrhœa so treated there have been no cases of epididymitis or arthritis and only four of chronic discharge.

Fundamental Points in the Diagnosis of Pulmonary Tuberculosis.

By JAMES CROCKET

Glasgow Medical Journal, June 1922

WE have seldom seen condensed into such small space so much that is useful for the general practitioner to know about tuberculosis.

The writer emphasises the necessity for early diagnosis.

A family history is elicited in less than half the cases and the prognosis is rather better than otherwise where the family history is positive, as a negative family history indicates a virgin soil.

"Tuberculosis, deep-seated in character, is responsible, by its toxins, for a tremendous amount of chronic ill-health."

Speaking of pulmonary disease as compared to hip-joint disease he describes the characteristic contractions and says "You can almost diagnose the disease

from the condition of the sterno-mastoid and trapezius muscles"

Auscultation is a broken reed, or is only of value if there be in addition to the signs, definite symptoms present.

"The Von Pirquet test so far as adults are concerned is quite unreliable. When positive it merely indicates that the person has had tuberculosis—not that the tuberculosis is active and responsible for the symptoms present."

"It is vain to expect to find tubercle bacilli in the sputum in early cases of tuberculosis, 60.7 per cent. do not show them."

"Adventitious sounds on auscultation are absent in nearly 50 per cent. of all cases undoubtedly tuberculous."

The writer not only emphasises the importance of early diagnosis, but shows the great difficulty in carrying out such a diagnosis, so that no factor should be left out, family and personal history, the appearance of the chest and shoulders, X-ray screen and photograph as well as to a minor degree the ordinary means of physical diagnosis. None of these can be neglected if an early diagnosis is to be made.

Pituitrin in Obstetrics

By C HAL CLEVELAND, M.D.,

New Orleans Medical and Surgical Journal,
May 1922

THIS paper presents a useful review of the indications and contraindications for pituitrin in obstetrics. The author considers that the ideal case for pituitrin is the healthy multipara with a fully dilated cervix, the membranes ruptured, the head presenting normally, resting on a relaxed and easily stretched perineum, but with the pains shewing a tendency to lag. His summary of the indications for pituitrin is as follows—

"Indications (1) weak pains in the second stage of labour and occasionally near the end of the first stage if the cervix is dilatate. This is by far the most common indication. (2) In the second stage when the pains are weak and the patient is in "twilight sleep" or under an anæsthetic. (3) In accidental hæmorrhage—abrupt placenta—when the head is engaged and the membranes have ruptured. (4) Having changed a face into an occipital presentation strong pains are needed to force the occiput down on the perineum. (5) In the third stage after the delivery of the placenta, to cause retraction and contraction of the atonic uterus. (6) In post-partum hæmorrhage from atony. (7) In the puerperal stage where there are clots or pieces of placenta *in utero*. (8) In late puerperal hæmorrhage. (9) In Cæsarean section, directly into the muscle if the uterus does not contract promptly. (10) To control bleeding following curettage after miscarriage. (11) Some good results have been reported in cases of metritis and endometritis resulting from puerperal infection."

On the other hand pituitrin may be an agent causing the infant to "pass from foetal slumber into the sleep of death, out of the amniotic sac of this world into the shroud or amniotic sac of the next", and the contraindications given are as follows—

"Contraindications (1) Contracted pelvis. (2) Malposition and malpresentation. (3) Tumours blocking the passage. (4) Diseased uterus *e.g.* scars from previous section. (5) It should not be used early in labour when the cervix is closed or undilatable. (6) Cardiac disease with high blood pressure, since pituitrin causes an increase in systolic pressure. (7) Eclampsia, for practically all these cases have high blood-pressure. (8) Threatened asphyxia of the child *in utero*. Where the babe is already advancing laboriously and is somewhat stunned by the hardships of the way, where the os is incompletely dilated or some obstacle to progress exists the attempt to hasten delivery by the use of pituitrin may bring on tetanic contractions of the

uterus and close the placental circulation and thus asphyxiate the child. Pituitrin should never be used without first listening to the foetal heart sounds the danger signs are very slow, very fast, or irregular heart beats.

Among the bad results from the careless use of pituitrin may be mentioned (1) Perineal tears—and they are more common than most of us like to admit. (2) Lacerated cervixes—many a cervix has been torn by too early administration of pituitrin. (3) Pressure necrosis of the soft parts—this does not often happen. (4) Rupture of the uterus—a review of the literature on this subject reveals a number of these cases. (5) Asphyxiation of the babe by too prolonged uterine contractions—this accounts for a certain percentage of the infant mortality. (6) Cerebral hæmorrhage or other cerebral disease."

Bayer 205

THE following notes from various sources on the action of this drug will be of interest, in view of the possibility of the drug being of value in the treatment of kala-azar.

Weichloodt says that it acts equally well by intravenous and subcutaneous injections, and it is active even when given by the mouth. It diminishes the coagulability of the blood and excessive doses cause nose-bleeding. After giving several doses of one gramme each, albuminuria lasting for a few days has been noted. Flushing of the face and a feeling of well-being have been noted frequently.

A rise of temperature lasting up to 24 hours may occur. Doses up to one gramme may be given, but in the complete course of treatment not more than three grammes should be given. No benefit has resulted from the drug in cases of malaria or relapsing fever. Mayer and Zeiss note that animals once treated by "205" remain resistant to infection by trypanosomiasis for several months owing to the persistence of the drug in the blood stream in an active form.

There is now a good deal of evidence of the activity of this drug in trypanosomiasis, several cases of the African form of the disease having been apparently cured.

The points which remain to be investigated are

- (1) Is the drug equally effective in kala-azar?
- (2) Is it safer and at the same time more active than the antimony salts?

The albuminuria and lowering of the coagulability of the blood which have been noted in a number of cases are reasons for an attitude of caution in administering the drug in kala-azar.

Kala-azar Treated by "205" Bayer.

THE treatment of kala-azar is a subject of the greatest interest to medical men in many parts of India and the recent report of the treatment of a case by Dr Mollow of Sophia by Bayer's new preparation will arouse much interest.

Dr Mollow reports the case in considerable detail in the October number of the *Archiv für Schiffs und Tropen Hygiene*. Ever since the close relationship existing between African sleeping-sickness and kala-azar was discovered it has been the invariable rule for workers in India to try in kala-azar any drug which has been found effective in the African disease, and our present antimony treatment was adopted because of the efficacy of the drug in dealing with trypanosomiasis in animals and man. Consequently workers on kala-azar have been keeping a sharp look out on the results reported from the use of "205" and it was only the impossibility of obtaining supplies of the drug which prevented them from giving it a trial.

Dr Mollow's patient was a young man of 27, who appears to have contracted kala-azar while on active service in Greece. The diagnosis was not made until

the disease had become extremely advanced. The patient was weak, emaciated and very anæmic. He showed petechial eruptions on the skin, sores on the hand and scrotum, his gums were swollen and bleeding. The spleen was very greatly enlarged, filling up greater part of the abdominal cavity. The liver was also much enlarged. The urine contained a trace of albumen. The blood count done a few days before the treatment began showed 25 per cent Hb, 1,009,000 RBCS, 1,670 leucocytes, and the patient was in an extremely cachectic condition. The diagnosis was made by liver puncture, *Leishmania* bodies were found in the puncture fluid and in cultures made on the "N N-Boden" medium.

The treatment was given on the 13th of August at about 12 noon and consisted of an intravenous injection of 0.20 grms of "205" in sterile solution. Dr Mollow notes that the same solution had been given in a case of anterior poliomyelitis in a dose of 0.50 gm without harmful results. Twenty minutes after injection the patient had a severe shivering and his temperature went up to 39°C. About two hours later he was hot and flushed, had severe headache, profuse bleeding from the nose and swelling of the gums with oozing of blood. He vomited a bile-stained, slimy fluid and had a loose stool. The stool at first was slimy, later it contained blood-stained slime. The pulse was weak and of low tension. He was ordered injections of camphor, and towards 10 o'clock he felt better, the headache, vomiting and diarrhoea having ceased. He felt very weak, the temperature was 38.2°C, the pulse feeble. He passed no urine. In the night he had wild delirium. His heart became weaker and at about 4.30 next morning he died with symptoms of heart failure. Death took place about sixteen hours after the injection of the drug.

The possibilities were poisoning by "205," or anaphylactic shock. Dr Mollow points out that on several occasions in cases of syphilis, trypanosomiasis and other diseases, doses of five times as much have been given intravenously without harmful results and he concludes that the probabilities are against poisoning and in favour of anaphylaxis, or as the French call it "hæmoclastic shock." The heart weakness and the consequent disturbance of the circulation in the kidneys are regarded as having resulted from the dose of "205," and are comparable to what has long been recognised as occurring in certain cases of malaria in which a dose of quinine has at times precipitated pernicious symptoms or hæmoglobinuria. An immediate autopsy was impossible but spleen and liver puncture were carried out at once and numerous *Leishman-Donovan* bodies were found, but cultures on N N medium and on citrated blood were negative.

At the autopsy which was held 24 hours after death great enlargement of the spleen and liver and the following changes were found. There were 200 ccs of lightly blood-tinged fluid in the pericardial sac, dilatation and parenchymatous degeneration of the heart, catarrhal pneumonia, a small abscess of the spleen of one-third cm diameter, chronic fibrous peritonitis and a localised purulent peritonitis, parenchymatous and fatty degeneration of the kidney. *Leishmania* bodies were found in smears from the bone marrow but not in the smears from the spleen and liver, probably owing to the action of putrefactive bacteria which were present in abundance.

Dr Mollow considers that the case shows that "205" is effective in kala-azar, but that it should be given with great caution in very cachectic cases. Those who have experience of kala-azar know only too well that advanced cases are very bad subjects for poisonous drugs of any kind. Sudden death is very likely to follow from doses of medicine which would be easily tolerated by other patients and there are numerous instances of sudden death apart altogether from the administration of drugs. The case described by Dr Mollow was one in which the hæmorrhagic

tendency and the extreme cachexia would have made the Indian worker hesitate before trying a drug such as "205" or antimony, and it is rather unfortunate that the first trial of the drug should have been made on such a patient.

The fatal result will naturally be a warning to other investigators to be very careful in earlier trials of the drug. The makers of "205" are exercising the greatest caution in having thorough tests of the drug carried out before issuing it to the public, such tests are being carried out under strictly controlled conditions. In the meantime the proved success of antimony salts will reconcile us to patience in awaiting the results of the newly suggested treatment.

It is conceivable that the extreme activity of the drug may be a cause of difficulty, as the sudden destruction of enormous quantities of *Leishmania* bodies and the setting free of the products resulting from their death might very well give rise to such symptoms as are described by the writer of the article above referred to. It will probably be some time before an authoritative statement regarding the value of the drug in kala-azar will be available and it is to be hoped that hopes will not be prematurely roused as has been the case with some other incompletely tried remedies.

The Treatment of Eclampsia.

DR THOMAS WATTS EDEN in the *British Medical Journal* of October the 14th, 1922, makes an authoritative statement upon the present position of the treatment of eclampsia.

This subject has been discussed on several occasions within recent times in the *Gazette* but it is of such importance in India that Dr Eden's paper is worthy of comment. Modern treatment wavers between two antagonistic views, the one of Dührssen who pays no attention to medical treatment but advocates the early emptying of the uterus either by Cæsarean section or by vaginal Cæsarean section. The other line of treatment is that of the Russian Stroganoff the main points of which are —

- (i) Isolation in a darkened quiet room
- (ii) Attention to the cleansing of the mouth, throat and nose after fits and keeping the patient on her left side. Fresh air or if necessary oxygen.
- (iii) Morphia and chloral alternately until the fits are controlled.
- (iv) Milk only by the mouth, salines by the rectum.
- (v) Termination of the labour when the second stage is advanced.

Dr Eden deplors the lack of precision which exists in the views of obstetricians on the subject of eclampsia and attempts to rectify the error by laying down certain rules —

(i) Prevention is easier and better than cure. In 80 per cent of cases there are early signs, the chief being albuminuria and œdema, but often in addition headache, disturbance of vision and epigastric pain, sometimes accompanied by vomiting. Careful watching of the patient would allow of many cases being treated before fits develop. The treatment at this stage consists of rest in bed, fluid diet, chiefly water, saline purges, diuretics. A watch is to be kept on the amount of urine, the amount of albumin, the œdema and the blood-pressure. If progress is not satisfactory the labour is to be terminated without regard to the safety of the child.

(ii) If a fit has occurred removal to hospital is essential. The darkened room and the constant care of the respiratory passages by two trained nurses and also the presence of an expert medical man can only be secured in a hospital.

(iii) Cases of eclampsia vary very much in their severity and for the purposes of treatment they should be classified as mild or severe.

Severe cases are those which have more than ten fits, or continuous coma or urine which becomes solid on boiling. The case is mild if there are few and infrequent fits, if the mind is clear between the fits, and if the urine shows only a moderate amount of albumen.

Two-fifths of the cases are severe and in them the mortality is 32.4 per cent while in the mild cases it is 6.5 per cent.

(12) All cases should be treated with a minimum of interference, labour should be induced if it does not come on spontaneously and the second stage should be terminated by forceps when the head has reached the perineum. Cases treated by "expectant" methods show much the best results, rapid dilatation of the cervix is unjustifiable and Caesarean section shows a much higher mortality than do cases treated by simple obstetric measures or allowed to progress naturally.

(13) Simple medical treatment gives the best results and the Dublin method may be taken as representing a good standard which has given excellent results.

It is based upon the following points —

1 Constant supervision of the patient by a doctor or an experienced nurse in a quiet darkened room.

2 Complete deprivation of all food except water to a comatose patient nothing whatever even water, should be given by the mouth.

3 Stomach lavage to empty that viscus and clear it.

4 Colon lavage for the same purpose, repeated as required to keep the colon empty. Great importance is attached by Dublin to this point. Very thorough lavage is practised, several gallons of fluid being run in and out through a long tube the procedure sometimes occupying as much as an hour-and-a-half.

5 Purgation by salines administered both by stomach and colon.

6 No obstetric procedure, whatever until labour is near the end of the second stage.

7 Administration of morphine in total doses of half grain to one-and-a-half grains.

The present master of the Rotunda, Dr Gibbon Fitzgibbon, has slightly varied this treatment by the omission of the morphine.

Dr Eden is not prepared to say that the Dublin method is the last word that can be spoken on the subject. It is without doubt the only treatment required for cases which can be classified as mild. Further clinical inquiry however is needed and will be undertaken at the instance of the British Congress of Obstetrics and Gynaecology, to determine whether taking the Dublin method as the basis of treatment better results could not be obtained in severe cases by associating with it other procedures.

A Simple Container for Transport of Vaccine Lymph in the Tropics

By H. LYNTHURST DUKE, B.C., M.D.

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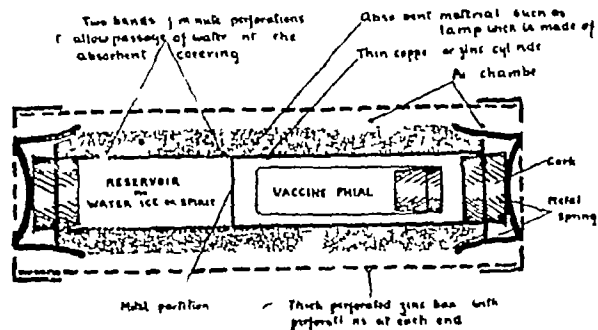
Transactions of the Royal Society of Tropical Medicine and Hygiene 19th Jan, 1922

In this short note Dr Duke gives an account of a simple carrier for vaccine lymph in the Tropics, as designed by Mr. E. C. Haddon, Laboratory Assistant Uganda. The design will be easily grasped from the diagram here reproduced.

With water placed in the reservoir three sets of experiments were carried out to test the difference between the temperature of the interior of the apparatus and the external atmospheric temperature.

In open air exposed direct to the sun's rays the carrier shewed a temperature of 11°C lower than that of the air. In a hot, humid atmosphere the difference was from five to six degrees centigrade. The higher the external temperature the more marked the cooling effect of the apparatus, thus at 40°C

atmospheric temperature the container read 25°C, and at 25.5°C atmospheric temperature the container read 22°C. The apparatus is cheap,



easily made in a bazaar and results with ice or spirit would probably have given even greater degrees of cooling.

ANNUAL REPORTS.

Report of the Medical Department, Hongkong, for 1921.

In this report a suggestion has been made that as with typhus, many of the special characters of cerebro-spinal meningitis may be well explained by supposing an insect to be the carrier of the disease. It has been found that overcrowding and indifferent sanitation are not the governing factors in its causation.

For cerebro-spinal meningitis is often distributed irregularly even amid conditions of overcrowding and squalor, and, it has broken out not infrequently among townspeople and soldiers particularly in barracks, under circumstances in which insanitary conditions could be excluded, or, at all events, were not discoverable. Or it may be confined within narrow limits, although the defects of hygiene may be as great round about as in the areas affected. Epidemics have occurred which were confined to the inmates of one institution to one regiment in a garrison even to one block of houses.

Further it has often been transported from one place to another by people, soldiers, for example, moving about.

Report of the Pasteur Institute of Southern India, Coonoor, for the year ending 28th February 1922.

THE total number of patients treated was 3,471. Five patients died during the course of treatment from hydrophobia, nine within fifteen days of completion of treatment and twenty-seven as failures of treatment. Hence the total hydrophobia rate is 1.20 per cent and the total failure rate is 0.780 per cent. The inquiry as to the chances of infection among persons bitten by rabid animals who have had no specific treatment has given the following results —

Number of persons bitten	377
Number treated	131
Deaths from hydrophobia among the treated	Nil
Number untreated	246
Deaths from hydrophobia among the untreated	133
Mortality from hydrophobia per cent of total number of persons bitten	35.2

The criterion of the infectivity of the biting animal is the death from hydrophobia of one of the persons bitten.

Extracts from the Annual Report of the Executive Health Officer, City of Bombay, for 1921.

VITAL STATISTICS

THE year under report began with the outbreak of influenza which was conspicuous during the first four months of the year. Plague and small-pox assumed epidemic proportions from the latter half of March until the end of May.

The total deaths for the year numbered 53,609 against 45,839 in 1920 and 68,610 in 1919. The death-rate for the year was 46 per 1,000 persons living as against 47 and 70 in 1920 and 1919 respectively. The figure 53,609 includes 2,135 deaths among persons newly arrived in and not belonging to the City.

Plague caused 811 deaths during the year against 282 in 1920 and 702 in 1919, the lowest annual numbers of deaths from plague since the first appearance of the disease in the City being 599 in 1915, 702 in 1919 and 282 in 1920.

The number of deaths from small-pox in 1921 was 406, being 112 more than in 1920 but 374 less than in 1919.

The number of deaths attributed to cholera was 70 against 119 in the antecedent year and 2,092 the mean of the preceding five years (1916-1920).

The outbreak of influenza commenced in January and followed on a recrudescence of the disease in the latter months of the previous year. The death-rate from influenza continued to rise until the end of April and although in May and the following months the mortality gradually declined, the disease was present until the end of the year. The deaths from influenza and diseases of the respiratory system to which deaths from influenza are frequently attributed numbered respectively 1,389 and 21,982 during the year against 1,605 and 18,737 in 1920 and 1,942 and 24,055 in 1919.

The live births registered during the year numbered 19,125 against 19,731 in 1920, the birth-rate per 1,000 of persons living was 16.26 as against 20.14 in 1920.

The infant mortality 12,751 was 1,855 more than in 1920, the rate of infant mortality per 1,000 of births registered was 667 as against 552 in 1920.

Compared with the decennial averages (1911-1920) the total number of deaths shows an increase of 13,804, the principal increases in the mortality being 9,023 under diseases of the respiratory system, 636 under influenza, 1,626 under the group of malaria, ague and remittent fever and 1,561 under diarrhoea, enteritis and dysentery. On the other hand decreases were registered under plague (958), cholera (1,203), small-pox (157), tuberculosis (625) and measles (113). The number of live births registered in 1921 was 1,603 less and the number of infant deaths 3,423 more than the mean of the decennium (Table No 21).

INFANT MORTALITY

The percentage of infant mortality to the total mortality at all ages was 23.78 against 23.77 in 1920 and 19.72 in 1919.

Causes of Death—8,902 or nearly 70 per cent of the total deaths in infants were due to diseases of the respiratory system, infantile debility and premature birth against 68 per cent (7,422 deaths) in 1920. Diarrhoea and enteritis caused 981 deaths, and malaria, ague and remittent fevers 254 deaths. The deaths from small-pox and measles numbered 77 and 66 respectively.

Of the total deaths among infants, 2,227 or 18 per cent took place in the first week of life and 1,650 or 13 per cent in the age-period 1 to 4 weeks.

The mortality among infants who had not completed the first month of life was thus 3,877 or 31 per cent of the total infant deaths. The number of deaths in the age-groups 1 to 6 months and 6 to 12 months was 4,168 and 4,706 being respectively 32 and 37 per cent of the total infant mortality.

Debility and prematurity play a great part in the causation of death in the first 4 weeks of life and of respiratory diseases during the remaining 11 months of infancy.

PREVENTION OF INFANTILE MORTALITY

THE work which is being done in Bombay for the reduction of infant mortality may be described under the following heads—

- (i) Visits by the Municipal District Nurses for the purpose of getting into touch with prospective mothers and for discovering cases of sickness especially among women and children and unvaccinated children, for inquiry into the condition of new-born infants, and for giving instruction by homely talks as to the care and rearing of children.
- (ii) Attendance on confinements.
- (iii) Provision of necessities and comforts during the lying-in period.
- (iv) Maternity Homes.
- (v) Infant Milk Depôts.
- (vi) Infant Welfare Centres.

Municipal Nurses—During the year the number of Municipal Nurses has been increased from ten to twenty, two being attached to each of the ten District Registrars' Offices. They are all qualified midwives and visit daily the localities and the chawls inhabited by the poor and help to diffuse and popularise elementary knowledge of the principles of health and hygiene and to carry such knowledge into the homes and lives of the ignorant, they give advice on the prevention of diseases and the care and upbringing of infants and bring to the notice of the authorities unregistered births, unvaccinated children and cases of sickness, they also persuade prospective mothers to go to the Maternity Homes provided for them free. Where this provision is not taken advantage of, they attend on the women in their own houses providing them with bedding for their confinement, and with food in the shape of milk and bread during the first days of the puerperal period. The visits of the Nurses are frequently the means of bringing to the Municipal Dispensaries sick persons who would otherwise either not know of the existence of the facilities provided or knowing would through indifference and stupidity neglect to benefit by them. These visits are doing much good and are welcomed and appreciated by those for whose benefit they are paid.

There are three Municipal Maternity Homes.

Infant Milk Depôts—Two Infant Milk Depôts have been established, one at the Bellasis Road and the other at the Parel Road Maternity Home for distributing daily pure milk free or at a nominal price for the benefit of children born in the Homes or under the supervision of the Municipal Nurses. 30,295 seers were distributed at these depôts during the year.

Malaria—As in other provinces of India the report shows an incidence of malaria.

The spleen rate for the whole City was 5.92 in 1921 as against 4.41 in 1920 and 1.37 in 1919. The Sections in which the spleen rate was higher than the mean for the whole City, were Fort North, Esplanade, Umerkhandi, Dhobi Talao, Mahalakshmi and Worli. The great rise in Worli (22.04) was due to the large number of labourers brought from up-country for the Worli reclamation works. These labourers and their families were "carriers" of malaria. The rise in the Fort North was also due to the same cause.

The spleen rate among the children attending the municipal schools varied from 4.2 to 5.9 per cent. The parasite rate in random sampling for the various sections of the city was from 3.48 to 7.54 per cent.

The following table shows the summary of work done during the year—

Particulars	Total for 1921
Number of wells filled in	32
Number of wells hermetically covered	5
Number of wells covered with trap-doors	9
Number of inspections of buildings	67,575
Number of notices issued	717
Number of cisterns hermetically covered	305
Number of children examined for enlargement of the spleen	7,732
Number of blood slides examined	396

Number of quinine pills distributed	22,301
Number of quinine pills distributed, grs II	13,100
Number of quinine pills distributed, grs IV	9,201
Number of pools treated with pesterine	11,025
Number of odd receptacles removed	8,580
Number of low-lying areas filled in	16
The league for combating venereal diseases attended	1,298 persons
These 1,298 cases with the addition of 230 cases carried over from last year, have been classified by the Medical Officer in charge of the Dispensary as follows —	

	Males	Females	Total
Syphilis	409	104	513
Gonorrhœa	550	219	769
Soft Chancre	170	76	246
Total	1,129	399	1,528

Annual Report of the Chemical Examiners Department, Bengal, for 1921.

THIS report by Major T C Boyd, DPH, I.M.S., contains much interesting information 3,141 articles were examined as against 5,831 in 1920, the decrease being chiefly in the number of articles received from the Excise and Explosives Departments. Of 18 samples of milk received from hospitals no less than 12 were adulterated, a striking testimony as to what 'milk' is like in the presidency towns of India. 8 out of 17 samples of *ghu* were adulterated. Of 8 water samples 3 were usable, 1 bad, 3 suspicious, and only one good. Of conundrums sent for opinion chloroform decomposition products, and the testing for arsenic in antimony compounds used for treatment of kala azar cases, are of interest. 1,251 medico-legal cases were investigated. The percentage of detection in human poisoning cases was 45 per cent. and the chief poison used was opium. Aconite was found in 34 of 805 human viscera and specimens received, arsenic in 33 and oleander in 41. Of special cases recorded accidental opium poisoning of a child of two by accidentally contaminated sweetmeats, hydrocyanic acid poisoning in spirituous liquor, homicidal administration of both arsenic and aconite together in sweetmeats, and an unusual case of aconite poisoning in which the symptoms of poisoning were masked by the deceased having been under the influence of *bhang* at the time of taking the poison are of interest. 18 persons were poisoned by aconite mixed with 'pachai' liquor, apparently in order to increase the thirst of the drinkers whilst a case of croton-oil poisoning of a well is surely unique. There was a marked decrease in the cases under the head of animal poisoning, from 87 cattle in 1921 as against 111 in 1920—probably as a result of the passing of the Poisons Act.

Dr Hem Nath Adhikary, B.A., M.B., was in charge from February to August 1922 and by his retirement Government has lost the services of an able and faithful servant.

Annual Clinical Report of the Raja Sir Ramasami Mudalliar's Lying-in Hospital, Madras, 1921

THIS interesting report by Major W C Gray, I.M.S., analysis the results of 1,524 confinements during 1921. 1,008 are classified as natural labours, 141 as difficult, and 61 and 244 as preternatural or complex respectively, in addition to 70 abortions. Primiparæ constituted 29 per cent of cases, and the month with fewest confinements was February,—a month which appears to present a consistently low figure in the records from 1880-1921. Maternal mortality was only 0.82 per cent,—if cases admitted in a moribund state be excluded,—an exceptionally fine record for India. Eclampsia and ankylostomiasis are important factors in the mortality rate. In treating the former condition venesection and a conservative method of procedure are advocated there were 26 cases of which only 5 died. 9 occurred ante-

partum, 7 intra-partum, 10 post-partum. The blood pressure in the fatal cases ranged from 150 to 200 mm. 90 per cent of the confinements were among women under the age of 30. The number of the pregnancy varied from the 1st to as many as the 12th. Of the different classes of labour concerned Major Gray notes—(1) that there were 1,008 classified as natural labours with cephalic presentation. There was no mortality although 5 face and 1 brow presentations were included, and the average duration of labour was 15 hours for primiparæ and 9 for multiparæ. (2) Of difficult, tedious and laborious labour there were 141 cases. Forceps were applied in 74 cases, podalic version in 4 cases, craniotomy in one instance. There was no maternal mortality, and only 4 children died. (3) Of preternatural labours there were 61 cases, mostly breech presentations with no maternal mortality, and a 13 per cent infant mortality. Labour in some instances lasted up to 67 hours or longer. (4) Of 244 complex labours, complicated by some accidental occurrence or diseases dangerous to either mother or child or both, there were 43 complicated by severe hemorrhage, and 23 maternal convulsions. There were 21 cases of twins, 10 with dual vertex presentations. (5) Of 69 abortions 37 were complete and 32 incomplete.

Turning to infant mortality 1,455 labours yielded 1,476 infants. Live births constituted 87 per cent, still births 10 per cent. 58 children died during the first ten days, 44 of which were under 4 lbs in weight. Female infants were 791 as against 685 males. A most useful table of indications for and results after forceps operations is given, and a detailed record of the 26 cases of eclampsia treated.

The Fifth Annual Report of the King Edward VII Memorial Pasteur Institute, Shillong, for 1921.

PART I

Pasteur Institute Section

THE number of patients who completed treatment during the year was 1,755 of which 105 were Europeans and 1,650 Indians. This number has gradually increased since 1917 when it was only 569 and shows the increasing popularity of the institute. Of these 1/15 died of hydrophobia, eight during or within fifteen days of completion of treatment and have not been regarded as failures of treatment. Thus the total hydrophobia rate, 15 deaths in 1,755, is 0.850 per cent. and the failure rate, 7 deaths in 1,755, 0.40 per cent. No cases of hydrophobia occurred amongst the Europeans treated, but considering that as much as 48 per cent of them were licked only, this absence of hydrophobia amongst the Europeans does not mean any racial immunity while only 17 per cent of the Indian cases were licked. The total hydrophobia rate among Indians was 0.910 per cent and the failure rate 0.43 per cent. The largest attendance occurred in the month of July and the people most bitten were found to be cultivators and students and school boys. Bengal sent as many as 1,042 patients, Assam 653, Bihar and Orissa 55 and the United Provinces only 5. From statements of the patients it was ascertained that probably 640 persons or twenty-six per cent. of the patients treated were bitten by jackals. The hydrophobia rate among those bitten by jackals was 1.90 per cent. as compared with 0.470 per cent among those bitten by dogs.

PART II

Bacteriological and Research Section Kala-azar

THE total number of patients admitted into the kala-azar ward during the year was 59. Of these six were proved to be suffering from malaria only, and were discharged.

Of the 53 cases of kala-azar—thirty were discharged, six were transferred to other hospitals, four left without completing treatment, eleven died, two remained under treatment.

The 30 cases which were discharged had a complete course of treatment and spleen punctures were done before they were sent out. The result of the examination of the spleen juice after treatment in these cases were as follows—

In 19 cases—Both cultures and films were found to be negative

In 8 cases—Films were negative but cultures positive, though the patients appeared to be quite healthy, spleen not palpable and blood picture normal

In 2 cases—Both films and cultures were positive, though the patients appeared quite healthy

In 1 case—Both films and culture were positive. The patient had not improved

This last case, a child aged 10 years, had had 375 grammes of sodium antimony tartrate, during a period of 11 months, with practically no benefit as regards his general health

Of the 11 cases which died, two had had no treatment, as they arrived in a moribund condition

Peripheral blood cultures (technique of Row) were carried out in 44 cases, controlled by cultures and films from spleen juice. In all cases in which L. D. bodies were present in spleen juice, peripheral blood cultures were positive

This section also carried out an investigation during November for the detection of diphtheria carriers. Cultures were made from the throats of 182 persons, mostly children, and 16 were found to harbour the germ in their throats

Colony of Mauritius.

Extracts from the Annual Report on the Medical and Health Department, 1921.

PREVALENCE OF SICKNESS AND RECURRENCE OF PARTICULAR DISEASES

THE following statement shows in a tabular form the number of cases treated in the public hospitals and at the dispensaries for the last five years

	1917	1918	1919	1920	1921	Average
Hospital Admissions	21,311	22,845	26,820	22,132	19,127	22,447 0
Dispensary cases	58,323	57,025	78,546	65,302	60,671	63,973 2
Outdoor cases	5,312	5,517	5,300	4,225	5,066	5,084 0
	84,946	85,387	110,666	91,659	84,864	91,504 2

These figures show a decrease, as regards hospital admissions and dispensary cases for 1921 compared with 1920, while a small increase is noticeable under the outdoor cases. The total number of cases is however less than that for 1920 and for the five-year period 1917-21

MALARIA AND HYPERTROPHY OF SPLEEN

Malaria is not a notifiable disease in Mauritius, so the number of cases cannot be accurately given beyond admission for the illness to Hospitals and Dispensaries. No blood examinations were conducted

The total number of admissions for malaria was 1,554, a decrease of 1,145 over the figure for 1920. The case mortality was 25 per cent. against 26 per cent. the previous year

The death-rate for malaria per thousand of the population was 93 compared with 97 for 1920 and 94 for the five-year period 1916-1920. The corresponding rates for deaths returned under Malaria and Malarial Cachexia were 94 for 1921, 99 for 1920, and 96 for the quinquennial period.

The return for the last ten years is as under—

1912	1913	1914	1915	1916	1917	1918	1919	1920	1921
3,063	2,546	2,935	3,728	2,905	2,939	3,262	3,390	2,699	1,554

In the public dispensaries a total of 14,633 cases of malaria were treated as against 19,941 the year before. This shows a decrease of 5,308 for the year 1921

SPLEEN CENSUS

A spleen census of the children attending school was taken twice during the year 1921. This enumeration by Medical Officers, of enlarged spleens among children in the several Districts of the Island is regarded as a fairly reliable index of the degree of prevalence of malaria in a locality and is specially useful for purposes of comparison. The results obtained were on the whole satisfactory the percentage being 10 per cent out of 27,988 children examined

Pneumonia—In the whole Colony the total number of deaths is 1,875 against 924 in 1920 and 964 for the five-year period 1916-20. The high mortality recorded in 1921 points to a severe prevalence of the disease

The admissions into hospitals were 323, with 112 deaths against 304 with 106 deaths the year before, the mean figure for the preceding five years being 297. This shows that pneumonia has been on the increase, possibly due to complications of influenza.

Influenza—In the whole Colony the deaths stand at 1,563 which is more than 4 times the figure for 1920. It is however less than the mean rate (2,184) for the quinquennial period 1916-1920

The hospital returns show 2,475 admissions with 149 deaths giving a case mortality of 5.9 per cent. against 2.1 per cent in 1920. For the period 1916-1920 the hospital admissions were 2,366 on an average, while the figure for 1920 is 2,106. This clearly shows that the prevalence of influenza was above normal in the early part of 1921

Bronchitis—The total deaths recorded in the Colony amounted to 753 against 621 in 1920 and 694 for the five-year period 1916-20. In this case the hospital admissions show a reduction in the figures (826 against 1,008 in 1920). The hospital death-rate was 2.7 per cent against 2.3 per cent the year before

Dysentery—Not notifiable—The mortality for dysentery in the whole Colony was 497, i.e., less than the year before, when there was a severe epidemic, the quinquennial figure being 737

Considerable improvement is noticed under this head, the hospital admissions being 412 in 1921 against 604 in 1920, and 742 for the five-year period 1916-1920

In the dispensaries however 1,264 cases were registered against 1,039 the previous year and 1,349 for the past five years

Enteric Fever—In the whole island 288 cases were registered against 168 in 1920, the highest figures being furnished by Curepipe, Savanne and Port Louis

Eighty cases were admitted for treatment in hospital, 30 more than in the previous year. The deaths numbered 28, giving a mortality rate of 35 per cent

Investigations in the Curepipe epidemic point to polluted water used to dilute milk and in the process of butter making being the probable cause.

In Port Louis the water supply is polluted all along its course, especially the supply from Grand River North West. No conclusive evidence was discovered in the Savanne cases

Leprosy—Not notifiable—The number of inmates at St. Lazare Leper Asylum on 1st January 1921 was 43 (Males 30, Females 13)

There were 15 admissions during the year (12 males and 3 females), 11 deaths and 10 discharges. There remained 37 lepers at the end of the year (24 men and 13 women)

Of the 15 admissions, 5 were new cases. They were in the following stages of the disease: Tubercular 2, Anaesthetic 2, Mixed 1. The new admissions came from Long Mountain 1, Port Louis 2, Camp de Masque 1 and Rodrigues 1

Leprosy in Mauritius is not classified as an Infectious Disease and is therefore not notifiable, but that the disease is common in the island is undoubted. Every day cases are met with in the streets of Port Louis and other villages. No restriction is made except as regards mendicant and criminal lepers

There is no law compelling compulsory segregation of lepers. They wander about at liberty living with their families and transmitting the disease. There is

nothing to prevent marriages between lepers, here the hereditary taint continues

Plague—Plague is a disease endemic to Mauritius. Port Louis is one of the endemic plague spots of the world.

The epidemic started in May and increased with the advent of the hot weather, reaching its maximum in November and finished at the end of December. The greatest number of cases were in proximity to the numerous grain stores in Port Louis.

Pulmonary Tuberculosis—Hospital admissions indicate a fall under this head 557 in 1921 against 744 in 1920. The case mortality was 238 per cent. against 247 per cent. the year before.

The mortality from tuberculosis in the whole Colony was 945 against 974 in 1920 and 941 for the five-year period 1916-20.

The following statement shows the classification of deaths from tubercular diseases for the last five years

DEATHS DUE TO	1917	1918	1919	1920	1921	Average for 5 years
Pulmonary tuberculosis and Phthisis	993	980	1,065	1,005	1,010	1,010
All forms of tuberculosis	1,019	1,107	1,104	1,030	1,035	1,040

Beri-beri—Not notifiable—In the whole Colony 71 deaths were registered against 29 the year before.

The hospital returns show 230 admissions with 22 deaths.

This represents an increase over the figure (133) for 1920.

Ankylostomiasis—For the whole Colony 34 deaths were registered against 16 the year before and an average of 15 for the five years 1916-20.

There were 212 admissions into hospitals with 7 deaths.

Small-pox and State of Vaccination—There has been no small-pox in the island since 1913. A total of 9,986 children were vaccinated during the year and 9,637 successes were obtained in the operation. In 49 cases the results could not be ascertained. The proportion of vaccinated children to total births is 69.5 per cent.

Puerperal Septicæmia—In the whole Colony 205 women died in consequence of the puerperal state. 20 cases received treatment in hospitals, 10 of these died, a proportion of 50 per cent.

Mental Diseases—The total number of persons certified insane on 31st December 1921 was 773, 32 more than the year before. This represents a ratio of insane to total population of 1 in 486 or 20.54 per 10,000.

The causes of insanity are reported as being due to mental worry, hysteria, malarial fever, grief, heredity, alcoholism, epilepsy, syphilis and gandia smoking.

ANTI-MALARIAL WORKS

During the year 1921, the following anti-malarial works were performed in the Island.

A—MINOR WORKS

- (1) **Maintenance** 1,460,350 feet or 276.6 miles of streams and drains were upkept, i.e., kept constantly clean and free from mosquito larvae.
- (2) **Repairs** 739,561 feet or 140 miles of streams and drains filled up by stones or otherwise damaged by floods were cleaned out and repaired during and after the rainy season.
- (3) **Rough Training** 17,085 feet of streams were roughly trained.
- (4) 7.5 acres of marshy land were weeded and partly filled up.
- (5) Holes containing stagnant water were filled up to the extent of 183 cubic yards.
- (6) **Footpaths** 24,810 feet of footpaths were made along the banks of streams to facilitate control.

B—MAJOR WORKS

- (1) **Channelling** 37,281 feet of marshy streams were centrally channelled.
- (2) **Drains** 54,750 feet of drains were cut to drain marshes, marshy stream and sewage water.

Reviews.

HISTORY OF THE GREAT WAR BASED UPON OFFICIAL DOCUMENTS. MEDICAL SERVICES. GENERAL HISTORY VOL I.—By Major-General Sir W. G. MacPherson, K.C.M.G., H. M. Stationery Office, 1921. 463 pp. 21/- net. Obtainable from Messrs. Thacker, Spink & Co., Calcutta, and all Agents for Government Publications, India.)

THIS volume is the first of a most valuable series, and is one which should be in the hands of all administrative medical officers. Prepared from official sources, it deals with the medical services in the United Kingdom and in British garrisons overseas, and during the operations against Tsingtau, in Togoland, the Cameroons, and S.W. Africa. Passing from a survey of the organisation, personnel and training of the British medical services before the war,—a portion which clearly shews the great influence which the S. African War exercised upon the efficiency of the medical services and the constant struggle between the requirements for efficiency and the non-possimus attitude of the Treasury,—the writer comes in Chapter 3 to medical mobilisation on the outset of the war. Special emphasis is laid on the value of the R.A.M.C. College at Millbank in raising the standard of efficiency of medical officers. "Millbank" has more than justified itself, and the institution of a similar college in India for I.M.S. officers would probably greatly increase efficiency. Thanks to well-rehearsed plans medical mobilisation at the outset of the war went forward with speed and smoothly, and by August 10th, 1914, not only was R.A.M.C. mobilisation complete but the St. John's Ambulance Brigade and the St. Andrew's Ambulance Association were also in full mobilisation order, ready to take the place of men who had departed overseas. The voluntary aid societies and associations were enthusiastic and the writer draws attention to the absolute necessity, under the Geneva Convention, for the official recognition and registration of such bodies. Only officially recognised associations are recognised by the terms of the Convention, and the authorities appear to have been embarrassed, rather than otherwise by the springing up of innumerable voluntary aid associations anxious to do things on their own, working independently rather than according to plan, and unaware of the necessity for registration and official direction and control. By degrees, however, as the whole nation became merged in the struggle, and as the administrative services enlarged, the medical services enlarged with a smoothness and an efficiency second to those of no other combatant nation involved. Before the war the accommodation in the military hospitals of the United Kingdom was 7,000 beds, of which 2,000 were occupied. By the Armistice the number of beds had increased to 364,133 including 18,378 for officers and hospitals for special classes of cases were dotted all over the country at convenient centres. Up to the 31st July, 1919, no less than 129,675 officers and 2,525,330 men—casualties and sick from different war theatres—had been disembarked and handled through eleven ports. At the outbreak of war there was only one military ambulance train in the country, twelve new ones were ordered on the 5th August, 1914, and the first was actually in full running order and in use on August the 24th. It speaks volumes for the efficiency of the hospital trains that out of over 2,600,000 casualties and sick carried in them, there were only six deaths from secondary hæmorrhage. With regard to hospital ships three cross-channel steamers mobilised with the first expeditionary force, but by August 28th the *Asturias* was already in commission and ultimately the hospital fleet under control of the military medical authorities in the U.K. numbered 75 ships.

A chapter devoted to the examination of recruits is interesting reading, especially in the sections dealing with dental defects. It was soon realised that if an army marches on its stomach, defective dentition is the most prevalent cause of rejection, and the Army Dental Service resulted. Recruiting of the medical services is a chapter to be read by all administrative medical officers. The military medical services started the war seriously undermanned. It had been estimated that for an overseas expeditionary force of the six divisions first sent 800 medical officers, 56 quartermasters, 9,000 other ranks and 528 nurses would be required. Many of those wanted were overseas and 83 R.A.M.C. officers were immediately taken for the War Office and Home appointments. The reserve services, fortunately reorganised in 1909-10, were still under even official strength. Despite the rush of volunteers the lack of trained military medical officers was acute, and in March 1915 the Director-General, A.M.S., announced that 2,000 further medical officers were required at once. The B.M.A., stimulated by the example of Dr. Hamilton of Hawick who was the first to call together a committee to conserve the interests of mobilised practitioners and smooth the path for recruiting, led the way in adjusting matters. In July 1915, a Central Medical War Committee took charge. By January 1917, more than half the medical profession at Home were in military service, and in January 1918, civilian practitioners numbered 11,482 as against 12,720 in military duty. The medical profession of the U.S.A. lent cordial support and fully qualified men in 1917, and America not only found the men and nurses but also found their equipment and pay. Of regular R.A.M.C. officers the numbers expanded from 1,279 in August 1914, to a maximum of 10,370 in August 1917, after which the last figure slightly declined.

Chapter 9 deals with medical and surgical equipment. Here the chief difficulty appears to have been at first to form a sufficient reserve. Stocks in the market were immediately depleted by the large purchases made by voluntary aid associations; the average expenditure on medical stores finally rose from £28,500 per annum in 1910-13 to £3,961,932 in 1917-1918. As is well known the medical and surgical equipment used underwent a thorough overhaul during the war and was brought entirely up-to-date, under the guidance of technical committees. Quinine represented a great difficulty. In 1916 twenty-one tons were demanded, and in 1918 the monthly consumption was 10,000 lbs. Forty tons were requisitioned under the D.O.R.A. regulations, and 30,000 lbs sent direct from India to Salonika.

Chapter 10 deals with Sanitary organisation in the Home Commands, and Chapter 11 with the organisation of voluntary aid,—a most important subject. Here it is well that the official point of view is brought out so clearly. Two unauthorised surgeons wearing non-official Red Cross brassards were, quite rightly, suspected when captured near Namur by the Germans to be spies. D.O.R.A. may be a cantankerous old lady, but her activities are very necessary in this connection; otherwise the field would be flooded with unofficial, overlapping and competitive organisations.

Chapter 12 deals with demobilisation. Here the value of the very laborious card index of officers which had been made was first really realised. Chapters 13 to 19 deal with the medical services in the Mediterranean garrisons, in Bermuda, Jamaica and Mauritius, Hong Kong, the Straits and Ceylon, and with the operations against Tsingtau, in Togoland, the Cameroons and S. Africa. They are illustrated by exceptionally good photographs.

One small feature of the book is very apt. If the Tommy who protested against "being inoculated for the fourth time against V.A.D." was confused in his terminology, the medical officer who has not yet acquired mastery over the different permutations of

capitals in current vogue will find them all on page vi, from A.D.M.S. to W.A.A.C.

The whole volume is one which demands careful study by all administrative medical officers who may at any time be faced with similar problems. It is well put together and exceptionally readable.

TYPHUS FEVER.—By J. M. MITCHEL, I.M.S., Dr. I. N. ASHESHOV, M.B. and Dr. G. P. N. RICHARDSON, M.B. Baillière, Tindall and Cox, London. 48pp. 3-6 net.

THIS is a little book of 48 pages in which the subject of Typhus fever as met with in Europe at present is dealt with from the points of view of diagnosis, prevention and treatment. For those who have to deal with the disease in modern times a book of this kind is a necessity, as the classical descriptions of typhus are very misleading. A novel feature of the book is the description of specific serotherapy by the use of the serum of convalescent patients. The results were disappointing, but on the other hand good results are claimed from the use of non-specific horse serum.

Protective inoculations by the use of the serum of typhus patients inactivated by heat are described, but the data are hardly sufficient to justify an opinion as to the value of the procedure.

A few temperature charts and illustrations of the typhus rash would have been a very useful addition to this little book.

DISPENSING MADE EASY.—By Wm. G. SUTHERLAND, M.B., 5th, 1922 edition: revised by A. L. TAYLOR, Ph.C., M.P.S. John Wright & Sons, Bristol. 98 pp. 6/- net: interleaved 7-6

THIS is the fifth edition of a most useful and well bound and edited little book. As the author rightly claims much of the space in ordinary text books on dispensing is devoted to pill-rolling, pill-coating, the making of capsules and emulsions, matters which concern the dispensing chemist less than the cost of his drug bill and increased ease in dispensing. The book is thoroughly practical, and sets forth the ideal for a medical practitioner compelled to dispense his own medicines, a subject in which the training of the medical student is admittedly deficient. Among most valuable little points in the book may be mentioned the use of different sized stock 8-dose bottles for patients of all ages from 3 months to 16 years and upwards, the use of different types of stock labels to distinguish private and hospital patients, a table shewing cheaper methods of prescribing such drugs as Tinct. Nucis Vomicae, Sp. Chloroformi, etc., a review of the Dangerous Drugs Act 1920, and 74 pages of formulæ for the rapid and easy preparation of stock prescriptions. Appendices shew an alcohol dilution table, percentage equivalents in grains per fluid ounce—a table constantly needed for reference, solubilities in water, solubilities of alkaloids in glycerine, and a dosage scale for different ages. The interleaved edition leaves room for memoranda and private formulæ. The whole small volume is an admirable asset for the chemist and dispensing physician alike, and full of useful information. The succinct aphorisms for dispensers is perhaps the best feature in the book.

THE DIAGNOSTICS AND TREATMENT OF TROPICAL DISEASES.—4th, 1922 Edition—By E. R. STITT, A.B., Ph.G., M.D. 622 pp. with 169 illustrations. H. K. Lewis and Co., London. 18/- net.

THE 1922 edition of this well-known little book provides the practitioner and student with every essential in tropical medical practice. Still issued at a very low price, "Stitt" is an invaluable handbook. In the new edition every single chapter has been re-written and the whole volume is fully up-to-date. Noguchi's recent work on yellow fever has been included, whilst there is much new information in the chapters on food deficiency diseases, beri-beri and pellagra. Six new chapters have been added to the book, viz., on epidemic jaundice, rat bite fever, tularæmia, tables of helminthic and arthropodan diseases, and a chapter on the diagnosis of tropical

joint, muscle and bone lesions. Extensive additions have been made to the chapters on diagnostic problems and procedures, whilst a full account of acidosis and a table of the significance of the findings in blood chemistry add great value to the book. The total number of pages has been increased from 521 to 622, and the illustrations from 119 to 159 but, by the use of small print in sub-sections, the book still remains very handy in size. Of features of special value may be mentioned a table for the differentiation of malarial parasites and another for the human entamoebæ, a clear resumé of certain problems in malaria which remain to be solved such as the etiology of relapse, a very able and up-to-date chapter on the leishmaniasis, an entirely re-written chapter on amoebic dysentery with illustrations from Dobell, a section on rat destruction, sections on new treatments in leprosy, and a full account of the recent war work on typhus. The most excellent chapters at the end of the book on cosmopolitan diseases in the tropics, onset and temperature charts of tropical diseases, blood examinations in tropical diseases, the circulatory, respiratory and lymphatic systems in tropical diseases etc. supply the practitioner with an invaluable guide to differential diagnosis—a feature in which this book excels. The chapter on neurological considerations in tropical diseases will well repay perusal.

In brief "Stitt" in its new edition is certainly what it has always been, the very thing wanted for constant reference and for systematic reading. The tropical practitioner cannot open and read a single chapter without getting new ideas, and new information of value. The binding, paper and illustrations are excellent. The book is free from all redundancy and is one which is certain to retain its universal popularity.

THE DISCOVERY OF THE CIRCULATION OF THE BLOOD—By Charles Singer, M. D., D. Litt., L. R. C. P. *Classics of Scientific Method Series* G. Bell and Sons London 80 pp 1-6 net

THIS is an admirable little monograph from an admirable series of little volumes. Not merely the layman, but also the medical man and the research worker will be interested in Dr. Singer's well written, carefully compiled and useful little book. Commencing with ancient days he reviews in turn Aristotle's views—who regarded the heart as the seat of intelligence and the source of bodily heat, the views of Galen on the liver as the source of the veins, the passage of blood from right to left auricles through imaginarily minute pores in the septum and his curious doctrine of the sources of natural, vital and animal spirits, views which mislead later investigators for 1400 years, the Renaissance and the work of Leonardo da Vinci (surely one of the most immortal of scientific investigators), Vesalius and the new anatomy. Servetus with his curious blending of physiology and the Bible, and his demonstration of the pulmonary circulation, Realdo Columbus and the demonstration of the valves in veins by Fabricius and his training of Harvey. Coming to Harvey himself, 1578-1657 the author rightly allows much of Harvey's immortal contributions to be told in his own words and emphasises his hesitation to depart from orthodox views, his extensive and careful animal observations in the midst of a royal and busy practice, his powers of clear thinking and of impartial deduction, and his discovery of the true facts with regard to the circulation and the functions and structure of veins and arteries. An introductory chapter sets before the lay reader the actual facts with regard to the circulation of the blood, in order that he may the more readily grasp the errors shown by earlier workers and the importance of Harvey's work. The book closes with a chapter devoted to the introduction of the microscope by Galileo, the actual demonstration of the circulation in the lung and mesentery of the frog by Malpighi, and the discovery of the red blood corpuscles by Swammerdam and Leeuwenhoek.

Dr. Singer's little book is in every way an admirable one, and should find many readers. Not the least

important element in it is the way in which he shows how scientific method ousts ignorance and imagination. The epoch-making papers of science are largely inaccessible to the ordinary reader. It is the aim of this excellent little series of books to supply the gap by connected narrative, reference and bibliography.

THE AMERICAN ILLUSTRATED MEDICAL Dictionary. By W. A. Newman Dorland, A. M., M. D., F. A. C. S., 11th, 1921 Edition. W. B. Saunders Co., Philadelphia and London. 1,922 pp Price 35/- net

THIS is not merely an illustrated medical dictionary, it is a handsomely bound profusely illustrated and extraordinarily complete "dictionary of the terms used in medicine, surgery, dentistry, pharmacy, chemistry, nursing, veterinary science, biology, medical bibliography, etc., including much collateral information of an encyclopedic character." We can think of nothing medical to which this volume does not contain an answer, thus if we look up 'karyokinesis' we find a full-page colour illustration, "staining methods" devotes 25 admirable and well indexed columns to a description of all histological and laboratory stains in general use, 'spinal cord' gives a useful table of localisation of the functions of different segments from Starr, "bandages" is fully illustrated in two full-page illustrations, 'arteries' contains three pages of colour illustrations and a table of 14 pages giving their names, origins, and branches. In an appendix is a very complete posologic and therapeutic table. Being unable to inform a student as to the derivation of trypanosoma, we found the answer in this volume.

Dorland's Medical Dictionary was first published in 1900. The constantly increasing demand for this beautifully published and invaluable handbook of reference is shown by the fact that the 1921 edition is the 11th, and that the 10th edition of 1920 is already exhausted. In this edition special additions have been made in the fields of biological chemistry, endocrinology, immunology, and neurology. It is difficult to think of any possible feature of value which is omitted, full-page colour illustrations abound, the binding, paper and printing leave nothing to be desired, and the book is not merely a dictionary, but an invaluable compendium for reference for the medical practitioner, whether specialist, general practitioner or laboratory worker.

SEX PROBLEMS IN WOMEN—By A. C. Maglian, M. D., London, William Heinemann, Price Rs. 12-6 net, pp. 219, 1922.

PRUDERY and mawkish modesty it has been said are the birthright of the English, and certainly when we look back on the Oscar Wilde trial, the reception of the works of Havelock Ellis, the first impressions of the neo-psychology of Freud, we are satisfied that this continental jibe was deserved. A jibe one may say which has been taken up again and levelled at our profession to-day by our Latin brethren, for it is a lamentable fact that not one in ten of our general practitioners dealing as they must do with the intimate relationships of families has read even one of the classic volumes of Havelock Ellis. Is it to be wondered at then that these volumes translated from our continental Allies and late enemies, satirise us as ostriches? Admittedly the present curriculum of students is long and arduous. Admittedly there is little time or scope for study of the works of Bloch, Sanger, Kraft Ebbing, Freud and Ellis, but that is no justification for the total ignorance and egotistic burking by graduates of a subject which is of fundamental importance in practice, for it is our duty and privilege to minister to the psychical as well as to the bodily happiness and welfare of patients. Indeed it is not too much to say that it is because the profession as a whole has shirked its responsibilities and failed in tactfully, scientifically and sympathetically dealing with the problems of sexual physiology and psychology, that we have to-day been pushed on one side and ignored by the public in their rush to absorb the host of pseudo-medical publications of the Marie Stopes' type. The

blame is our own and though we may smile cynically and continue to treat people as cold uncomplimentary machines, the fact remains that 90 per cent of the profession to-day are unresponsive or ignorant. Let them read and learn from the conversation of Socrates with Theodote, the head of the Hetairi of Athens, what tolerance and a knowledge of psychology can do. Let them study Macbeth and Hamlet and see how advanced was Shakespeare.

Dr Magian in the volume before us has done for Britain what Malchow and Robie have done for America and what Hess and Kisch have done for Germany. He has not produced an enormous volume, but taking for granted the colossal prejudice and ignorance of the British medical man, he has briefly and accurately described in sixteen chapters the main problems that must face the general practitioner who has the confidence of his female patients and there is no question that he has ably fulfilled his purpose. This book is one to keep and have reference to. It is delightfully written.

Correspondence.

A SNAKE-BITE POSTER.

To the Editor of THE INDIAN MEDICAL GAZETTE

DEAR SIR,—I see in the *Indian Medical Gazette* for August 1922 (page 309) a notice of a snake chart poster published by Assistant-Surgeon T B Bhanagay, L M & S.

It is a pity this chart was not submitted to an expert, before your remarks were issued.

The information in many details, and with regard to lepidosis especially is incorrect, as for instance when Mr Bhanagay states that the anal shield in Russell's viper is divided. The whole chart in its essentials appears to have been cribbed from that issued by the Bombay Natural History Society, and sanctioned for use in Military hospitals. Where he departs from the information therein contained he slips into error. All the figures on his chart are cribbed from the Bombay chart, without permission from the Natural History Society and without any acknowledgment as to their source—Yours, etc,

F WALL,
Colonel, I M S

SIND CLUB, KARACHI
24th November 1922

EXPRESSION VERSUS CAPSULOTOMY

To the Editor of THE INDIAN MEDICAL GAZETTE

SIR,—Major Strother Smith has kindly allowed me to see Major Wright's letter regarding his article in the July number of the *Indian Medical Gazette*. Major Strother Smith has a big experience behind him, having operated on several thousands of cases with great success.

I fully endorse what he says about the preliminary preparation of the patient. The less done in this respect the better, especially in the case of jumpy and nervous patients. At our clinique in Shikarpur the patient is generally on the table within two hours of being examined and he has not time to fret and worry about the operation. I also doubt whether any method of the preparation of the eye is superior to that of Colonel Smith's alluded to by the writer of the article. A thorough washing out of the conjunctival sac with 1 in 2,000 Perchloride is sufficient for 96 per cent of cases.

Major Wright lays great stress on the fact that Colonel Smith was unable to produce mass statistics to

support his methods. This is inevitable in India, as it is almost impossible to follow up patients after they leave hospital, especially in the case of villagers, who form the larger portion of one's patients.

I rather deprecate Major Wright's attack on Colonel Smith and his methods, for I understand that Major Wright has only been on the staff of the Madras Ophthalmic Hospital three or four years and he cannot have the experience behind him of which Colonel Smith can boast. There can be no doubt of the popularity of those surgeons in the North of India who extract in the capsule. The largest cataract operator of the present day in India, Mathura Dass of Mogha, has won his fame through the intra-capsular method—Yours, etc

H T HOLLAND

MISSION HOSPITAL,
SRINAGAR, 15th October 1922

INTRAVENOUS AIR EMBOLISM

To the Editor of THE INDIAN MEDICAL GAZETTE.

DEAR SIR,—With reference to previous correspondence in your columns on this subject, I shall be glad if you will publish the attached letter which I have received from the editor of the *Therapeutic Gazette* in answer to a communication on the above subject—

"Dear Sir,

"In reply to your letter of 26th ultimo let me say that I have already called attention years ago in the editorial columns of the *Therapeutic Gazette*, to the fact that little danger exists from the injection of air into the vein, and many years ago published two papers along this line. Indeed it was I who demonstrated to Dr Reichert the fact to which you refer.

"The late Dr Nicholas Senn of Milwaukee published an exhaustive paper on this subject about 35 years ago.

"As I have already discussed the matter in original communications and editorials in the *Gazette*, I do not feel that I can take up the matter again at this time, but will bear it in mind for some future action—Yours, etc,

H A HARE."

The demonstration by Dr Reichert was the actual pumping of large quantities of air into the external jugular vein of an anaesthetised dog and the animal was none the worse for what had been done. The demonstration was made to convince the students that the danger of injecting air into a vein was a fetish, and one which was used now and then by surgeons who were unfortunate enough to lose a patient on the operating table.

Curiously enough when I was a house-surgeon many years ago I saw a very distinguished surgeon kill a patient by accidentally opening her internal jugular vein during the performance of a tracheotomy preparatory to excising the upper jaw. Blood flowed into the trachea with immediately fatal results. The surgeon turned to the gallery and said that unfortunately a vein had crossed the line of incision and that the entrance of air had caused the patient's death.

I may add that in this case the post-mortem was performed by the surgeon and his house-surgeon and no one was permitted to witness it—I am etc,

F J W PORTER,
Major, R A M C. (Retired)

93, NEPEAN SEA ROAD,
BOMBAY,
26th August 1922

Service Notes.

COUNTESS OF DUFFERIN'S FUND

ALTHOUGH nursing is one of the most important adjuncts possible to medical and surgical treatment it is only comparatively recently that attention has been paid

to it in India. Even now the majority of Indian hospitals have no nursing arrangements other than those which can be made by dressers or ward coolies. The need for improving this state of things must strike every medical man and it is good news that a part of H. E. Lady Reading's Women of India Fund is to be devoted to the interests of Indian nurses. Up to the present day Indian nurses occupy mostly subordinate positions, one seldom or never hears of an Indian Matron or Sister. With a view to helping Indian nurses to attain the highest positions in their profession Her Excellency Lady Reading is offering scholarships in order that they may proceed to Europe to gain additional experience especially as regards administrative work. It is of great importance that nurses selected for those scholarships should be women of high character as well as intelligence, and great care will be taken in the selection. Special application-forms are being supplied from the office of the Lady Reading Fund, 1 Cavalry Lines, Delhi.

Another venture of the Lady Reading Fund is the establishment of a hostel in connection with the Lady Hardinge Hospital, Delhi, where Indian nurses will live and will be sent out to nurse in private houses on the requisition of a doctor. This is the first time such a project has been started in Northern India and it is being opened on a small scale, but with the hope that it may be enlarged and that other similar centres may be started if the first proves a success.

The combined Travelling Exhibition of the Lady Chelmsford League and Victoria Memorial Scholarship Fund is now in working order although still on a small scale. It is hoped during the next year or two to improve it and add many useful models, etc. In the meantime it is available for Local Committees, who may desire its services and who are prepared to meet a share of the expenses. It is under the charge of a trained Health Visitor, who explains the exhibits, gives lantern lectures, etc., etc. It spent 10 days at Etawah on the occasion of the Annual District Fair in November and in December was on view for three weeks in Delhi, a vacant school having been obtained for the purpose.

Miss G. DAVIDSON, M.B. Ch.B., Miss R. Carr, M.B. Ch.B., and Miss M. A. Murphy, M.B. Ch.B., have been appointed to the Women's Medical Service, India.

PROMOTIONS

The following promotion is made, subject to His Majesty's approval—

Lieutenant-Colonel to be Colonel

HAROLD JOHN KINVAHAN BAMFIELD, D.S.O., *vice* Colonel Thomas Arthur Granger, C.M.G., M.B., I.M.S. (Bengal), retired with effect from the 1st August 1922. Colonel Bamfield's tenure of appointment will reckon from that date.

LEAVE

THE Governor-in-Council is pleased to grant Lieutenant-Colonel W. M. Houston, I.M.S., Health Officer of the Port of Bombay, leave on average pay for eight months combined with leave on half average pay for four months, with effect from the 18th November 1922 or the subsequent date of relief.

COLONEL R. C. MACWATT, C.I.E., M.B., F.R.C.S., K.H.S., I.M.S. Inspector-General of Civil Hospitals, Punjab, is granted, with effect from the 14th October 1922, privilege leave for one month and nineteen days and in continuation leave on average pay for one month and two days.

LIEUTENANT-COLONEL H. HALLILAY, M.B., I.M.S., Civil Surgeon, Simla (West), is granted leave on average pay for three months with effect from the 1st November 1922.

LIEUTENANT-COLONEL L. T. ROSE HUTCHINSON, M.A., M.D., B.C. DPH (Cantab), I.M.S., Surgeon, Goculdas Tejpal Hospital, Bombay, has been granted extension by ten days of the leave sanctioned in Government

Notification No S-20 (10), dated the 2nd October 1922.

LIEUTENANT-COLONEL W. GLEN LISTON, C.I.E., M.D., DPH I.M.S., has been granted by His Majesty's Secretary of State for India, pending retirement, extension by two months and twenty-seven days on average pay and eighteen months and twenty-two days on half pay of the leave sanctioned in Government Notification No S-20 (10), dated the 1st September 1922.

APPOINTMENTS

LIEUTENANT-COLONEL F. M. SUMNER, M.B., F.R.C.S.E., I.M.S. Civil Surgeon, Simla, (East), is appointed to hold charge of the duties of the Civil Surgeon, Simla (West), in addition to his own during the absence on leave of Lieutenant-Colonel H. Hallilay, M.B., I.M.S.

CAPTAIN R. H. MALONE I.M.S., is appointed temporarily to the Medical Research Department, with effect from 1st November 1922.

THE Governor-in-Council is pleased to make the following appointments during the absence on leave of Lieutenant-Colonel W. M. Houston, I.M.S., Health Officer of the Port of Bombay—

Dr H. C. VENIS, DPH, Health Officer of the Port of Karachi, to act as Health Officer of the Port of Bombay.

Lieutenant H. F. Otto, I.M.S., to act as Health Officer of the Port of Karachi.

IN supersession of Government Notification No S-39 dated the 24th October 1922, the Governor of Bombay is pleased, under section 23 of the Code of Criminal Procedure, 1898, to appoint Lieutenant-Colonel W. H. Leonard, I.M.S., to be a Justice of the Peace within the limits of the town of Bombay.

THE Governor with the concurrence of the Minister is pleased to make the following appointments—

Major K. G. GHARPUREY, I.M.S., on return from leave, to be Civil Surgeon, Sholapur.

Lieutenant-Colonel H. A. F. Knapton, I.M.S., to be Civil Surgeon, Ahmednagar.

THE Governor with the concurrence of the Minister has been pleased to appoint Lieutenant-Colonel A. J. V. Betts, M.B. (Lond), I.M.S. to be Civil Surgeon, Nasik, *vice* Lieutenant-Colonel J. H. McDonald, M.B., C.M. (Edin), I.M.S.

UNDER the provisions of rule 24 (2) of the Punjab Electoral Rules, His Excellency the Governor of the Punjab is pleased to appoint Colonel R. Heard, M.D., I.M.S. being an official, to be a member of the Punjab Legislative Council, in the vacancy caused by the resignation of Lieutenant-Colonel D. M. Davidson.

POSTINGS

LIEUTENANT-COLONEL G. HUTCHESON, I.M.S., Civil Surgeon, on return from leave, to Dehra Dun.

LIEUTENANT-COLONEL W. LAPSLEY, I.M.S., Civil Surgeon, on return from leave, to Agra.

RESIGNATIONS

CAPTAIN NAGENDRA NARAIN MAJUMDAR is permitted, subject to His Majesty's approval, to resign his temporary commission, with effect from the 25th October 1922.

CAPTAIN VITTAL NARAIN BENEGAL is permitted, subject to His Majesty's approval, to resign his temporary commission, with effect from the 1st September 1922.

THE undermentioned officers are permitted, subject to His Majesty's approval, to resign their temporary commissions, with effect from the date specified—

Captain Shankar Vmayak Joshi, Captain Chakrat Govinda Menon, Captain Jatindranath Mukerji—Dated 1st September 1922.

His Excellency the Governor of the Punjab is pleased to accept the resignation of Lieutenant-Colonel D M Davidson, CIE, IMS, of his seat as a member of the Punjab Legislative Council, with effect from the afternoon of the 20th November 1922

TRANSFERS

THE services of Major B Gale, MB, IMS, are placed temporarily at the disposal of the Government of the Punjab with effect from the date on which he assumes charge

THE services of Lieutenant-Colonel W W Jeudwine, CMG, MD, IMS, are placed temporarily at the disposal of the Chief Commissioner of Delhi, with effect from the 20th September 1922

EXTRACT FROM GOVERNMENT OF INDIA, ARMY DEPARTMENT, No 749, DATED SIMLA, THE 5TH SEPTEMBER 1922

Method of reckoning service towards increased rates of pay of length of service

Officers of the Indian Medical Service who were granted accelerated promotion to the substantive rank of Captain, but were not paid as such until the completion of three years' service as Lieutenants or until 1st September 1916, whichever date was earlier, will be allowed to reckon their substantive service for increase of pay in the rank of Captain

The reckoning of service by British Service Officers for increase of pay will be governed by the rules contained in the Royal Warrant for Pay, 1914, as amended by Army Orders of 1921

The foregoing rules give no claim to pay of a higher rank before promotion to such higher rank under the rules governing service for promotion

All previous orders on this subject are cancelled

No 752, DATED 5TH SEPTEMBER 1922

Revised rates of pay and allowances for officers of the Royal Army Medical Corps and the Indian Medical Service holding temporary field medical appointments

With the approval of the Right Honourable the Secretary of State for India, it has been decided that the pay and allowances of officers of the Indian Medical Service holding temporary field medical appointments, shall be as follows—

(1) Temporary staff appointments in the field, such as Assistant Director, Medical Services, and the Sanitary Adviser, Lines of Communications—Pay under Army Instruction (India) No 25 of 1922

(ii) Other field medical appointments—Consolidated pay of rank and service under Army Instruction (India) No 613 of 1920 plus the following allowances

For charge of—	Rs per mensem
(1) Field Ambulance or casualty clearing station, per section	60
For the whole of an organised unit of four sections of field ambulance or casualty clearing station	240
(2) General Hospital of 100 beds and over	120
" " " 200 " " "	180
" " " 300 " " "	240
(3) Convalescent camps and depots of—	
200 beds and over	60
300 " " "	120
500 " " "	180
1,000 " " "	240
For charge of—	
(4) Hospital ship or ambulance transport of—	Rs
100 beds and over	120
200 " " "	180
300 " " "	240
(5) Sanitary section	60

The above rates of pay and allowances shall have effect from the 1st January 1920, unless the emoluments hitherto drawn are higher than those now sanctioned, in which case these rates shall have effect from the 5th July 1922, and shall apply to future incumbents only

It has also been decided with the approval of the Right Honourable the Secretary of State for India, that officers of the Indian Medical Service holding the temporary field medical appointments detailed below shall, with effect from the 5th July 1922, receive the charge allowance noted against them in addition to the consolidated pay of their rank and service as laid down in Army Instruction (India) No 613 of 1920

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(4) Ambulance railway train of—	
100 beds and over	60
200 " " "	120
400 " " "	180
(5) Base depot of medical stores—	
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Permanent medical store-keepers shall receive pay under Army Instruction (India) No 882 of 1921	
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Original Articles

BACTERIOLOGICAL NOTES ON AN EPIDEMIC OF SEVEN-DAY FEVER

B. C. J. STOCKER, M.C., M.A., M.D. (Cantab),
CAPTAIN, I.M.S.

THE opportunity for this investigation was an epidemic of seven-day fever which broke out amongst the officers and men of the 79th Carnatic Infantry in the spring of 1914. The results I think, are worth recording, partly as tending to confirm work on the subject done by Sir Leonard Rogers, and partly as I consider that the results of treatment with a sensitised vaccine were encouraging and are worth repeating.

Although the disease is not serious, and has no sequelæ worth mentioning, it is so rapidly disseminated among a community living under military conditions, and causes so great a loss of working days, that anything tending to shorten the illness is of special value in military medicine.

The 79th C. I. after marching from Aurangabad to Bombay remained there under canvas for some three months, and embarked for Rangoon on March 8th. The health of the troops till embarkation was good, but on March 9th the first case of seven-day fever occurred on board ship, and from that time onwards till the end of July there was a steady admission of cases to hospital, amounting to some 120 in all, including a considerable number which, for various reasons, did not come under my care.

The vast majority of cases occurred after arrival at Rangoon, but quite a number occurred on board ship, and it is a noteworthy fact that culicine mosquitoes were present on board being associated with a consignment of fruit.

General features of the disease—After an incubation period varying, apparently, from a few hours to two days, the onset was, as a rule, sudden, but not always, sometimes associated with a rigor, more often not. The chief complaints were headache, pains at the back of the eyes, and a dull aching in the small of the back, and in the limbs generally.

The facies was typical, somewhat suggestive of typhus, infected conjunctivæ, flushed and heavy.

The tongue was thickly furred with red edges, and the breath offensive.

Morbilliform rashes were noticed in a few cases, in one case almost hæmorrhagic in intensity, this case had a second rash at the crisis, both lasting about 36 hours. But the patients were for the most part Madrasis and rashes were not very obvious.

Joint and shin pains were conspicuous by their absence, but pains in the big muscles, especially the calf muscles, were the rule.

The spleen was not enlarged but frequently slightly tender, the liver was not affected.

The temperature is best seen in the accompanying charts, where the relatively slow pulse will be noticed.

During the fever slight constipation was the rule, but slight diarrhoea at the crisis was not uncommon.

Special cases—In a few cases special symptoms deserve special notice. In six cases there was a definite neuritis with loss of knee-jerks, paræsthesiæ, and partial anæsthesia of the lower limbs, muscular wasting and foot drop. In one of these cases there was partial anæsthesia of the left half of the body. In this case the anæsthesia was so complete that a needle could be passed right through a fold of skin in the left leg without the patient being aware of it.

One case, an officer's wife, complained of the same symptom, but had no other signs of neuritis. In neither case was there any hyperæsthesia anywhere.

Four cases had definite cardiac affection in addition to the neuritis, with dilatation and œdema of the whole of the lower limbs, back and face. In fact they were strongly suggestive of beri-beri.

One case, an officer, was particularly interesting inasmuch as he had slightly enlarged glands in the groin on the day of onset. Examination revealed twenty mosquito bites on one knee and twenty-two on the other, the result of working in the office overnight, wearing shorts. The incubation period in this case could not have been more than a few hours.

Several other cases also showed slightly enlarged and tender glands in the groin.

The two officers who were the first to be attacked, within a week of landing in Rangoon, were the only two who had not been using mosquito nets.

Differential blood counts—With a view to discovering what changes, if any, occurred in the blood of patients, differential counts were taken daily in a number of cases, two of which are shewn in Charts 2 and 3*. The only change that was in any way constant was the increase in the number of eosinophiles which began about the fourth or fifth day and was most marked about the eighth or tenth day, generally after convalescence was established. It did not in any way depend on the severity of the attack; indeed one of the most marked cases, in which a count of 22 per cent was obtained, was the case of an Indian officer who had only two days' fever, the count being taken six days after the temperature had fallen.

Some of the more severe cases had no marked eosinophilia and sometimes none at all.

*The Editor much regrets that want of space prevents publication of more than 6 out of Capt. Stocker's 65 charts of the disease.

Blood cultures—Blood cultures were taken in 27 cases the method being to take 5 cc from a vein and to inoculate it into 50 cc of broth. Of 27 cultures so taken three were contaminated, eighteen sterile, and six showed a growth of a bacillus which, for convenience, I call here bacillus Z. The growth did not appear till after 48 hours in the incubator, and was very scanty, there being practically no naked eye changes. It would be very easy to miss it altogether, indeed, I only discovered it by accident.

I should state here that I was unfamiliar at the time with Sir Leonard Rogers' work which had only recently been published, and I started with the idea of the disease being protozoal in origin and made numerous attempts to culture the blood on a Nicolle Novy MacNeal medium, but these cultures were all negative and need not be referred to again.

The cases in which the cultures were positive were serial Nos 36, 38, 39, 41, 46 and 48 (*vide* Chart 2).

Bacillus Z—*Morphologically* was 4-5 μ long, very slender, very slightly motile, and the most characteristic thing about it was the tendency to filamentous forms.

Staining—Gram-negative. A few flagella could be made out by Loeffler's method.

Cultural characteristics—In broth growth almost invisible, and none appeared before 48 hours' incubation. No scum and very slight turbidity at the bottom of the flask. On blood-agar and glycerine-agar it grew more readily, appearing as minute discrete semi-transparent colonies. Sugar reactions—no acid or gas with inulin, saccharose, dulcitol, adenite, lactose or glucose. Milk not curdled after 48 hours. One culture showed very slight acidity in adenite, saccharose and dulcitol—no gas after 48 hours' incubation.

Inoculations into a monkey and a goat produced no apparent result, but as they were both old residents in Rangoon they may well have been immune.

In one case a complement deviation test was tried with blood from a case which had already had the disease, and using watery extract of bacillus Z as antigen, but the result was negative. I do not attach much importance to this experiment however.

Agglutination tests—These were tried in some seventeen cases with bacillus Z. The results and dilutions were as follows—

Case	Result	Dilution	On 1st day of illness
50a	Negative		
47	Aglt'd	1 in 40	1st " " "
52a	Negative		2nd " " "
42	Aglt'd	1 in 10	2nd " " "
48	Aglt'd	1 in 40	2nd " " "
40	Aglt'd	1 in 50	6th " " "
38	Aglt'd	1 in 160	7th " " "
44	Aglt'd	1 in 80	8th " " "

The remaining cases in which agglutination tests were tried were all negative specimens being taken on the first day.

It would therefore appear that agglutinins are developed in small quantities from the fifth to

the eighth day. It should be noted that some cultures were exceedingly difficult to work with owing to a tendency to auto-agglutination. In the cases quoted above the controls were all completely negative.

Sensitised vaccines—It was thought possible that some good might be done by the use of a sensitised vaccine. Accordingly a goat was inoculated with repeated and increasing doses of an emulsion of bacillus Z until its serum agglutinated in a dilution of 1 in 320. At this stage the first vaccine was prepared from a blood-agar growth, and made up in doses of 100 to 1,000 million. The bacillus was left in contact with the serum at room temperature for 24 hours, washed, shaken and the doses counted and bottled in the usual way. Being uncertain of the effect of the vaccine I naturally started with very small doses subcutaneously and in the first half dozen cases in which it was tried there was no appreciable result, the dose being apparently too small, but in the next series there was a result, though not quite as good a result as I had hoped for. I shall refer to this later.

The reason I persisted with the vaccine was that the patients themselves asked for it and were evidently under the impression that it relieved symptoms.

Charts 4, 5 and 6 show the effect of bigger doses, and in these cases the patients were very definitely of the opinion that the treatment was efficacious.

I very much regret that at this stage the investigation had to be stopped owing to the slacking off of the epidemic and the arrival of preliminary mobilisation orders.

Had I been able to I should have doubled the dose in the next case.

Carrying insects—Concurrently with the above experiments an attempt was made to trace the origin of the infection, and the method of distribution and the first thing which naturally occurred to one was to search for biting insects in the men's quarters.

The most obvious insect population at the beginning of the epidemic was *Culex fatigans* and towards the end of the epidemic *Stegomyia fasciata*, the change being quite sudden and almost complete in two days.

It appeared possible that the contents of the stomach of insects caught in the men's mosquito nets, and full of blood, might be worth investigating. Accordingly a number of specimens of *Culex fatigans* were caught and cultures taken from them as follows—

The mosquito, killed by tobacco smoke, was deprived of its wings and legs and laid on its back on a sterile slide, and the head removed with sterile needles. The penultimate segments were then nicked on each side, so as to just break the cuticle but not to destroy the continuity of the gut inside. The insect was then held up by the terminal abdominal segment and gentle traction exerted on the thorax with sterile forceps, so

that the thorax and the abdominal cuticle with the exception of the terminal segment were drawn off the distended stomach and gut, like a finger stall off a finger. The gut and the distended stomach were thus left suspended in the air from the terminal segment grasped in the forceps, and cultures taken from the blood exuding from the neck end of the stomach—neglecting the first drop to come out. The manipulations were not difficult after the first few attempts.

The results obtained were as follows—

Of 24 mosquitoes thus treated eleven grew nothing, nine grew a bacillus which I call here bacillus X either in pure culture or mixed with some other organism and four grew an actively motile spore-bearing, Gram-positive organism which need not be referred to again.

Bacillus X had the following characteristics—

Very faintly motile, 3-5 μ long, differing from bacillus Z in being slightly more robust, and in not showing the same tendency to filamentous forms.

It was Gram-negative, and showed a few flagella by Loeffler's method.

The cultural characteristics were exactly the same as those of bacillus Z. Slow growth and faint turbidity in broth, no pellicle, no indol formation, no acid or gas in lactose, inulin, saccharose, dulcitol, adenite, or glucose, and no coagulation in milk after 48 hours in the incubator.

Growth on blood-agar and glycerine-agar was the same but more vigorous.

Conclusions—One is not entitled to make any definite conclusions from the work described above but as far as it goes it tends to confirm Sir Leonard Rogers' work. I disagree with him however in that I am convinced that this organism is the causative agent in producing seven-day fever. I am quite aware of the fact that experiments have shown the virus to be a filter-passer, and in this connection I would like to put forward the following hypothesis tentatively and only as a basis for further research—

It is well known that a bacillus giving all the characteristics of bacillus Z is a fairly common inhabitant of the normal human intestine. It is referred to in Sir Leonard Rogers' book on "Fever in the Tropics." I would suggest that this bacillus and Rogers' bacillus, and bacillus Z, and bacillus X are the same. They all give the same cultural reactions.

It is not unreasonable to suppose that if it is a normal inhabitant of the intestine, the host may become sensitised to the proteins of that bacillus.

The mosquito becomes infected with the bacillus possibly by being bred in infected water.

When a person is bitten by an infected mosquito the bacillus is inoculated into that person, and when this occurs one of two things may happen. If the dose is large, the bacillus goes on multiplying in the host and creating febrile disturbance by its exotoxins till sufficient opsonins are developed, then phagocytosis takes

place, the proteins of the bacillus are set free, and the patient being sensitised, anaphylaxis is set up causing a second rise in the temperature and the saddle-back chart so common in this disease. This would explain the eosinophilia and also perhaps the filter-passing experiments in transmission.

Or if the dose is small, or the patient's resistance good, phagocytosis takes place at once before the bacillus has a chance of multiplying, the endo-proteins are set free and, the dose being small anti-anaphylaxis is set up preventing the second rise of temperature and producing the short type of fever.

The paradoxical results of getting a bad result with a small dose of the vaccine and a good result with a large one are shown in the charts. It cannot be denied however that chart 6 shows a good result—one which I admit that I am unable to explain. The subject of anaphylaxis is bound up with many such apparent inconsistencies.

THE FIELD FOR RESEARCH IN INDIAN INDIGENOUS DRUGS*

By R. N. CHOPRA, M.A., M.D., B.Ch. (Cantab.),
MAJOR, I.M.S.,
and

B. N. GHOSH, F.R.F.P.S. (Glasgow),
Calcutta School of Tropical Medicine

CONSIDERABLE interest has of late been taken by the Indian public and by its professional members regarding the use of indigenous drugs in the treatment of disease. Indeed it has been argued that apart from economic considerations, these drugs are more suited to the habits of the people and the climatic conditions that prevail in this country. The question of the restoration and development of the indigenous systems of medicine has therefore been discussed in the Indian Legislative Assembly and the different Provincial Councils. While we are not concerned here with the merits of such revival, we have no doubt that out of the large number of drugs used by Kavi-rays and Hakims for centuries past and still in use, there are some at least that deserve the reputation they have earned as cures. On the other hand there are others of little therapeutic value that are given only because they are mentioned in some old manuscripts, and no one has taken the trouble to confirm the truth of these statements. Medicine is a progressive science, in every department an attempt is being made to replace empiricism by rationalism, and nowhere is this more evident than in the science of pharmacology and therapeutics.

Thus when it is said that ashoka (*Saraca indica*) is useful in menorrhagia, punarnava (*Boerhaavia diffusa*) in dropsy, and abrak bhasman (calcined talc) in diabetes, the profession

* Being a paper read at the meeting of the Medical Section of the Asiatic Society of Bengal on December, the 13th, 1922.

will not accept these assertions, as these are symptoms and signs and not diseases, what we want to know is their particular value in the cedemas of the heart, kidney, etc., and how they act to restore the tissue to the normal. We do not wish to be misunderstood or desire for a moment to question the value of these drugs, but the scientific mind is not satisfied by mere statements, no matter from what source they may originate, unless corroborated by clinical and experimental evidence. This necessitates careful work, which means time and unbiassed study. The active principles responsible for the therapeutic action have to be isolated and worked out. The way in which the effect is brought about and the manner in which the important organs of the body are affected has to be determined by animal experiments. Then comes the question of making suitable preparations, and how to preserve them so that their employment may be independent of climatic and seasonal variations. The standardization of drugs and preparations by chemical and biological methods of assay is an important factor to secure therapeutic uniformity, so that the amount of active principle given in each dose is not subjected to irregular variations. These variations for obvious reasons are most undesirable, and may do more harm than good, especially when one is dealing with potent drugs. Fresh juices and decoctions are efficacious, but for all practical purposes their utility must be very limited. Until these drugs are investigated on scientific lines their use by the profession in India must necessarily be restricted, whilst other countries not bound by these traditions will not use them until the case is proved as to their utility.

The study of Indian indigenous drugs was first begun in the early part of the last century, and it was confined chiefly to the collection of available information about various medicinal plants. The earliest contributions were from Sir William Jones' "Botanical Observations on Select Plants," John Fleming's "Catalogue of Medicinal Plants, 1813" and Roxburgh's "Flora Indica." These were followed by O'Shaughnessy's "Bengal Pharmacopæia, 1844," Waring's "Pharmacopæia of India, 1868," Mohideen Sheriff's "Supplement to the Pharmacopæia, 1869," David Hooper's "Materia Medica of Madras," Dymock's "Materia Medica of Western India," 1883, and "Pharmacographica Indica." These works are very valuable as containing not only information from Ayurvedic and Tibbi sources, but also personal observations and experiences of the writers. Later Warden and Hooper carried out a very laborious study of the chemical composition of many of the important drugs. The Indigenous Drugs Committee (now abolished) did useful work, and was responsible for obtaining authentic specimens of tried remedies, making standard preparations, and encouraging their use in the various Government Institutions throughout the country. Besides these efforts, many individual workers have from time to time taken up

some drug and tried to establish its pharmacological action by modern methods of research, but these workers have been handicapped by want of properly equipped laboratories.

Admirable as their attempts have been, yet the pharmacology of most of the indigenous remedies remains an unexplored field. The investigation requires a considerable outlay of money, as a well equipped chemical laboratory with a liberal staff of competent chemists is essential. Medicine is now intimately related to chemistry, and the ultimate solution of most problems, whether physiological or biological, rests on some physical or chemical basis. This is forcibly presented to us in the study of the action of drugs. The importance of the co-operation of chemists at every stage of research work can only be realised by the workers themselves. Without the chemists' help any progress in work is absolutely impossible. A larger staff of chemists is therefore needed in research institutes in this country, if we are going to achieve any results, and if our work is to be carried on with the same standard of efficiency as in other countries.

The time and labour required to work out the chemical composition of a drug is enormous. This may be judged from the fact that it would take an experienced chemist about two to three months to isolate in a pure state and roughly state the nature of the different chemical constituents of a single crude drug, the determination of the chemical constitution of the active principles concerned would take another two years, provided the chemist devoted his time entirely to one active principle. The isolation of a sufficient quantity of the active principles and testing them pharmacologically would take a few months. One can see that it will take years to complete the work on indigenous drugs which has now been started at the Calcutta School of Tropical Medicine. At present our work is seriously hampered owing to the fact that there is only one Professor of Chemistry without even an assistant, under these conditions the work would take a generation to complete.

The action of these drugs or their active principles can be established by a careful pharmacological and clinical study. The experimental work can be done only in a laboratory well equipped with all modern appliances. None existed in this country to enable one to do the work thoroughly on scientific lines. Fortunately, however, a beginning has been made in this direction at the Calcutta School of Tropical Medicine. The clinical study does not present much difficulties, but clinical and experimental work should go hand in hand in any research on drugs.

There is such an enormous field for research in this direction, and so little has been done, that it is impossible for any one individual or any one institution to cope with it. A large number of workers are needed who will co-operate with unbiassed minds to find the truth. Chairs in Pharmacology should be founded by the various

Universities and Medical Colleges and facilities given for research work. One can hardly expect that any interest in this subject will be created unless the teaching of pharmacology is improved and remodelled. At present there is no provision for giving instruction in practical laboratory work. In fact the action of drugs on tissues which forms the foundation of the treatment of disease is considered so unimportant, that it is taught when the student knows no medicine, and any medical man is considered capable of being proficient to teach this subject.

Research on indigenous drugs should be undertaken with three main objects in view—

(1) To make India self-supporting, by enabling her to utilise the drugs produced in the country, and by manufacturing them in a form suitable for administration.

(2) To discover remedies from the claims of Ayurvedic, Tibbi and other sources so as to be employed by the exponents of Western medicine.

(3) To discover the means of effecting economy, so that these remedies can come within the means of the great masses in India.

The first proposition is likely to lead to great results, because a large number of drugs which grow in this country are known both to Eastern and Western medicine and the properties and actions in many cases are not unknown. The research here might, with advantage, be diverted into two main channels. Firstly there are many drugs of established therapeutic value which are in use in the Pharmacopœias of different countries. The majority of these grow wild in great abundance in many parts of India and a certain number are even cultivated. Some of these are collected and exported—though an infinitesimal fraction only of the quantity produced—to foreign countries, and come back to us in the form of standardised pharmaceutical preparations and active principles in pure condition, probably at a price a hundredfold of the original crude product. A host of others grow, mature and eventually die without being put to any use whatsoever. There are numerous examples, but a few will suffice to illustrate the possibilities of their development.

Atropa belladonna (*Angur-i-shafa*) grows in abundance in the Himalayan ranges from Simla to Kashmir at an altitude of 6,000 to 12,000 feet. *Strychnos nux vomica* (*Kuchila*), the most commonly prescribed drug, grows everywhere throughout the tropical parts of India, *Hyoscyamus niger* (*Kherasam ajowan*) grows in the Himalayas at an altitude of 8,000 to 11,000 feet. *Datura fastuosa* (*Safed* and *Kala Dhatura*) and *D. stramonium* grow wild everywhere. *Glycyrrhiza glabra* (*Malathi*) grows in Sindh and round Peshawar. *Citrullus colocynthis* (*Indrayan*) is plentiful in the N-W F Province and in the Punjab. Many species of *Aconite* (*Katbush* or *Mitha Zahar*) and *Juniper communis* (*Aasar*) of good quality grow in the temperate Himalayas.

Digitalis purpurea grows in Kashmere, it is also cultivated at Mungpoo and in the Nilgiris. *Urginea indica* (*Jangh Priyaz*) or the Indian squill grows throughout the Peninsula. Several species of *Valerian indica* (*Asarun*) which grow in Kashmere and Bhutan have been found to be excellent anti-spasmodics.

I. The soil, the season and the gathering time are some of the important variable factors with plants, and it can hardly be expected that the amount of active constituents would be constant under all conditions. In some cases the quality is good and constant, but in the majority of instances the percentage composition of the active principles has yet to be determined by careful methods of chemical and biological assay, to show that these remedies, growing in a state of nature, are as good in quality as those of imported varieties. If however they do not come up to the required standard, the best method of bringing them into general use by improving the quality of the active principles by suitable cultivation, in parts of the country where this can be done economically, has yet to be determined.

II. Secondly, a large number of plants grow in India which, though not exactly the same, have similar properties and actions resembling the imported and often expensive remedies, and would form excellent substitutes. That such drugs exist is well known, but since no effort has been made to work out their medicinal properties on scientific lines, or to confirm the work already done, there is a great deal of uncertainty about their action. Unless this is worked out, it can hardly be expected that they will be taken into use by the profession, in place of more certain and tried remedies. We will give a few examples of these drugs to emphasize our statement. *Artemisia maritima* (*Kirmam* or *Kirmala*) grows abundantly in the high altitudes of the Himalayas. A powder made from the dried flowers is an excellent substitute for the expensive *santonin* and has been tried lately in Madras with success. It can be bought at Re 1 per pound in the bazaar. The corm of *Colchicum luteum* (*Suranjan*) from Kashmere closely resembles the official *C. autumnale* in composition. The root of *Gentian kurroo* (*Kutki*), of which several species grow in the Himalayas, contains the same principles, gentianic acid, and pectin as the imported European root and might with advantage be employed. *Claviceps purpurea* grows on the rust of wheat and has properties resembling ergot. *Coptis teeta* (*Tita*) from Assam contains the alkaloid berberine and is a bitter tonic resembling *calumba* in its properties, and *Picrasma quassioides* (*Bharangi*) from the tropical Himalayas and *Samadera indica* (*Samadera*) from Malabar, both contain a bitter principle similar to quassin, *Hemidesmus indicus* or the Indian *Sarsaparilla* (*Anantamul*) from Northern India and the Deccan has all the medicinal values of this latter drug. The seeds of *Ipomœa hedracea* (*Kala-dana*) and the root

bark of *I turpethum* (*Dhud* or *Tarbud*) contain the resinous principles of jalapin and convolvulin and are as active as the official *Ipomœa purga*, the ordinary jalap. This plant is not only found wild everywhere but is also cultivated in some parts of India. *Mentha arvensis* (*Pudina*) and *M sylvestris* from the temperate Himalayan regions yield an essential oil of good quality similar to the peppermint oil now imported in large quantities from China and Japan. Several species of *Blumea* especially *B balsamifera* and *B densiflora* which are plentiful in the Himalayas and are also found all over the Peninsula, yield a stearopten identical to camphor imported from Japan. Several medicinally active species of *Strophanthus* are indigenous to tropical India. *Naregamia alata* (*Tinpan* or *Pittvel*) growing in the Western and Southern regions of India and *Tylophora asthmatica* (*Antmul* or *Jungh Pikvan*) is said to have the properties of ipecacuanha. *Withania coagulans* (*Ashvaganda* or *Punur*) from the Punjab and Sindh has the power of coagulating milk similar to the ferment rennet. *Carica papaya* (*Pepiya*) is a common object in Indian gardens and yields a valuable ferment papain, like trypsin in action. The leaves contain carpine, an alkaloid having a digitalis like action. *Mylabris chiron* (*Teleni fly*) abounds in certain parts of Northern India and Kashmere, and has as good blistering properties as the Spanish fly and at less than a third of the price.

These are only a few examples among a host of others. It is obvious from this what an enormous field for research and development is presented by this group alone. If these drugs are worked out, their active ingredients recognised, their percentage composition determined, their action established and standardised and pharmaceutical preparations manufactured, the economic benefit will be immense to the country.

The second proposition of popularising and introducing new drugs to Western Medicine is a more difficult problem. In the indigenous systems of medicine almost every plant and shrub growing in the country has ascribed to it some medicinal property. These beliefs, in some cases, originate from the teachings of the ancient commentators and are based on clinical data, but in others there is nothing reliable. Their introduction was empirical and often a drug was used simply because a single case happened to have derived some benefit from it. In this way remedies have multiplied without proof but by belief, and, as they hail from all parts of India, no one seems to have a correct notion about their uses and properties. The employment of a large number of them would thus appear, as in Western medicine, to have been based on empirical evidence that is handed down from generation to generation. A thorough and complete research into all these drugs would occupy the life-long work of innumerable chemists, pharmacologists and physicians. For practical purposes, we recommend that advantage should be taken of the experience of Kavi-

rajs, Hakims and others, and that those drugs with great local reputation should be investigated first.

Dr Koman of Madras has lately made a clinical study of the medicinal properties of a large number of the indigenous drugs, and has come to the conclusion that the following drugs are of value, but that further research is necessary before they can be recommended for universal adoption—

Hydnocarpus wightiana for leprosy, *Calycotris flori-bunda* (*Chempullam*) as anthelmintic and laxative, it contains a neutral principle which gives all the reaction of santonin. *Eclipta prostrata* (*Babru*) as a cholagogue, *Boehraavia diffusa* (*Punarnaba*) as a diuretic, *Holarrhena antidysenterica* (*Kwuchi*) and *Bombai malabaricum* (*Simul*) in dysentery, *Euphorbia pilulifera* (*Dudhi*) in asthma and genito-urinary diseases, *Alstonia scholaris* (*Chhatim*) which contains the alkaloid ditamine as anti-periodic in malaria, *Sida cardifolia* (*Bala*) in diseases of the nervous system, neuritis and paralysis.

There are also a number of other plants which have the reputation of being efficacious in other diseases and which might with advantage be investigated. Examples of these are—*Adhatoda vesica* (*Bakas*) as an expectorant and anti-asthmatic, *Melia azadirachta* (*Nim*) which is being investigated by Dr K. K. Chatterjee. *Saraca indica* (*Asoka*) in menorrhagia, *Terminalia arjuna* (*Arjun*) as a cardiac tonic, *Balsamodendron mikul* (*Gugal*) as anti-rheumatic and nervous tonic, *Butea frondosa* as an anthelmintic for round worms, *Peganum harmala* (*Harmal* or *Asband*) as anti-asthmatic and febrifuge, *Saussurea lappa* (*Kut*) as an aphrodisiac and cardiac stimulant, *Aegle marmelos* (*Bel*) and *Plantago ovata* (*Isabgul*) and *Ailanthus malabaricum* (*Ood*) in chronic diarrhoea and dysentery, *Hebeptis mouniera* (*Brahmi* or *Safed chamni*) in hysteria and epilepsy, the seeds of *Psoralea corylifolia* (*Babchi*) in leucoderma.

The third and the last proposition is to effect economy, so that these remedies may reach the masses. This is only possible if the price of the drugs be considerably reduced, for in a poor country like India, there are millions of people who cannot afford an expensive course of treatment and have consequently to rely on charitable institutions. The cost of drugs is so heavy that most of these institutions, which have only a limited annual budget for drugs, are not able to cope with the demand for such common and essential drugs as quinine, castor oil, magnesia, etc,—to say nothing about the expensive drugs which are sometimes necessary.

The only way in which drugs can be cheapened and brought within the means of the masses is to utilise the action of the local products and substitute them for the more expensive drugs of Western medicine. In our opinion this can be done by encouraging the production, collection

and manufacture of indigenous drugs, and their pharmaceutical preparations in a systematic manner by (a) producing locally; (b) substituting equally potent drugs for the imported drugs. We have already referred to both classes of these remedies and the possibilities of their development. Their active principles can be isolated, and standardised preparations like tinctures, extracts, powders, etc., can be made without difficulty with the help of a properly equipped laboratory and inexpensive apparatus. If this can be done, it will not only save the sea-borne freight but there will be an enormous reduction in the cost of manufacture, owing to cheapness of labour. Tea dust from India and Ceylon is at present exported to South America and Europe at a nominal price and comes back to us as caffeine. Similarly, *nuxvomica*, *belladonna*, *datura*, *stramonium*, castor-oil seed and oil are all taken thousands of miles away for manufacturing refined products. Refined products are not now manufactured in India. There is no reason against it provided research on the drugs is properly organised and botanists, chemists, pharmacists, pharmacologists and clinicians co-operate with each other. The medical store depots at the instance of the 'Indigenous Drugs' Committee made pharmaceutical preparations of the well known crude official remedies which are indigenous to this country and issued them for trial to the dispensaries and hospitals with encouraging results. Some of the local firms in Calcutta have also taken up the manufacture of tinctures and extracts from some Ayurvedic and Tibbi remedies, but as these have not been properly investigated as regards their pharmacological actions, their use is limited amongst the profession. The whole of this subject should be looked at from a scientific as well as from a business point of view.

Secondly by using crude preparations the cost of treatment can be considerably reduced. During the war the price of quinine went up from Rs. 14 to Rs. 55 per pound and it still remains at this high price. The result is that most of the hospitals and dispensaries in the *mofussil* can only afford a limited quantity of this essential drug, which is quite inadequate to meet the hospital demand, in order to give quinine, the supply of other remedies has to be curtailed to make an attempt to meet the demand. The researches of Major H. W. Acton, I.M.S. have definitely proved that the total alkaloids of cinchona bark in crude form can be manufactured in large quantities in this country by the Government cinchona plantations and even now sell at one-fourth to one-fifth of the price of the pure alkaloids and are just as efficacious as quinine in benign tertian malaria, the most prevalent type of malaria fever in India. They have been tried in malignant tertian fever at the Carmichael Hospital for Tropical Diseases and in also some of the outlying dispensaries, and their efficacy appears to be in no way inferior to that of quinine. They tend to upset the stomach

unless taken at least an hour after meals, as the cinchonine hinders gastric digestion. A more extended use of these crude alkaloids in place of quinine would effect a great saving, as most of our quinine has to be imported from Java. The use of these crude products will bring the treatment of malaria within the means of the poor, thus alleviating the suffering that is caused by the most common and important disease in the tropics.

An investigation, on similar lines with the total alkaloids of other remedies will, we are confident, prove fruitful. The total glucosides of *Turpethum* or *J. hederacea* or the total alkaloids of *datura* may do quite well instead of the refined products.

III. The third and the last channel of research needs the co-operation of bacteriologists as well as of chemists. It is well known that there are certain micro-organisms which ferment various chemical compounds and produce important drugs which are largely employed in medicine, such as alcohol, acetone, acetic acid, glycerine, etc. In western countries bacteria have been used to produce these drugs on a commercial scale. In India the warm and humid climate of certain provinces would probably be particularly favourable to their action, without employing expensive artificial heat. The flora of these bacteria are at present unknown, whilst there are many cheap carbohydrates, fats, etc., available on the spot which could be utilised, if the facts were carefully worked out.

We have endeavoured in this paper to give a rough survey of the present position of the indigenous drugs of India and to give an outline of the main channels in which research can profitably be undertaken. The names of the drugs mentioned are merely by way of illustration, and are not meant to form an exhaustive list of drugs needing investigation. The inorganic medicines we have not touched, because their actions in most cases are well known, and their manufacture and purification come entirely in the province of the chemist. The task of bringing the whole of this subject on to a proper scientific basis presents many difficulties and requires much time and the labour of many investigators. A beginning should, however, be made, and the sooner the better. Even the development of some of the well-known official remedies, whose actions are known on the lines indicated, will be of considerable economic importance.

Apart from establishing the value of many useful remedies, there is another aspect of this work which should not be neglected in our survey. At the present time every indigenous drug is supposed to be a specific for some disease and the lay people will describe wonderful cures produced by some of these remedies. Statements of this nature, supported by insufficient evidence, have also appeared in medical journals. This has done a great deal of harm to their reputation and distinguished pharmacologists of

Europe and America are beginning to doubt if there is much value in the vast array of the Indian indigenous materia medica and are inclined to take the view that an investigation into the properties of these drugs is not likely to lead to any material results. In this way the reputation of these remedies has suffered in Western medicine, the good ones being classed with the bad. Only systematic research can establish the value of the useful ones, and at the same time eliminate a host of remedies of little value. The chaos that exists in the reputation and merits of these indigenous drugs will be removed and the true teachings of the Ayurveda and Tibbi medicine will become available to all the world. Truth asserts itself in the end and should be available to all for the good of suffering humanity.

These, gentlemen, are some suggestions as to the lines on which the future research on the indigenous drugs may be undertaken. We have perhaps looked at the subject from one point of view only. I would beg of the distinguished Kavirajs and other gentlemen who are interested in the problem of indigenous drugs to help us with suggestions as to how this important subject can be dealt with to the best advantage of the country.

Distinctions are often drawn between Allopathic, Ayurvedic and Tibbi systems and this has given rise to prejudices in the minds of the advocates of one system against even the good things of the other systems. This is taking rather a narrow view. Medicine is one science, it does not matter what you may call it. With an unbiassed mind we should take up what is useful in all systems and evolve one common system for the alleviation of the sufferings of humanity.

FURTHER PRACTICAL EXPERIENCE WITH THE ALDEHYDE TEST

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ABOUT a year ago I communicated a paper* on the "Aldehyde" test for kala-azar in which I gave my experience with the test up to the middle of November 1921. Another year having passed it is perhaps time to collect my year's results with this test and to estimate from them its value and its limitations.

The Name—Although the technique of the performance of this test is almost exactly similar to that of the formol-gel test for syphilis, the results and the standard by which one reads the results are entirely different, accordingly, I suggested that, in order to avoid confusion between the two tests and in order to prevent this test sharing the discredit which has inevitably fallen on the formol-gel test, another name should be applied to it. I suggested the name "Aldehyde Test" for various reasons. I do not think that it

was a particularly good name, but it is at least not misleading. My fears about the misleading effect of the name "formol-gel" were amply justified, as patients are continually being sent to the hospital as cases of kala-azar who have elaborately printed pathological report forms with the "formol-gel test for kala-azar" filled in as positive, when in reality the patient is suffering from chronic malaria and his "Aldehyde" reaction is decidedly negative. It appears that even the proprietors of clinical laboratories do not trouble to read their medical journals very carefully. Having read of the formol-gel test for syphilis and having heard that there is a similar test for kala-azar, they assume that it is exactly the same test and deceive their clients accordingly.

The test is performed and the results are read, shortly, as follows—

To one c.c. of clear serum one drop of formalin is added. The tube is immediately shaken to mix the contents and is left at laboratory temperature. Readings are made from time to time, but the final reading is taken at the end of 24 hours.

In a well developed kala-azar case the serum becomes cloudy immediately, at the same time it becomes viscid and within 10 minutes will have assumed the colour and consistency of the "white" of a hard-boiled egg. A negative result is constituted by the serum remaining quite fluid and clear, or by its becoming jellified but still remaining perfectly clear. Between the strongly positive and the negative results a number of intermediate readings will be obtained. The results can be classified under seven different headings and for each different heading a sign is suggested.

- | | |
|--|------|
| (a) If the serum becomes solid and completely opaque within 20 minutes | +++ |
| (b) If the serum becomes solid and completely opaque within 2 hours | ++ |
| (c) If the serum becomes solid and completely opaque within 24 hours | + |
| (d) If the serum becomes markedly opalescent and solid but never completely opaque | (+) |
| (e) If the serum becomes solid and slightly opalescent | (±) |
| (f) If the serum becomes solid but remains quite clear | (-) |
| (g) If the serum remains fluid and clear for 24 hours | —ive |

The first three can be classed as positive, the next two as doubtful, and the last two as negative. I have made one slight alteration in the signs that I now suggest.

The source of the cases—The results which I shall analyse are taken from the case sheets of out-patients at the School of Tropical Medicine kala-azar clinic and of patients in the kala-azar wards in the Carmichael Hospital for Tropical Disease, Calcutta.

The average daily attendance at the kala-azar clinic, which is open on two days a week, was for the months of October and November 1921 about 20. Of this number 55 were new cases of which 3 were cases of kala-azar. The average

attendance for the same months in 1922 was 98 01 cases, of this number 12 55 were new cases, of which 8 22 were cases of kala-azar Whereas a year ago we made a practice of puncturing the spleen of every new case whose spleen was puncturable recently we have had to abandon this practice on account of the increased numbers of out-patients, and now we only "spleen-puncture" a few cases each day The diagnosis of the other cases is made from the results of the aldehyde reaction taken in conjunction with the history of the case Only the out-patients in which spleen-puncture was done are included in this analysis

The results are analysed in two sets, hospital patients and out-patients

The Hospital cases—These consist of 114 cases that were admitted to hospital as kala-azar or as 'suspected' kala-azar of these 100 were eventually diagnosed kala-azar and 14 were diagnosed as some condition other than kala-azar

The diagnosis of the 100 cases was made as follows —

L D bodies were found in the first spleen puncture smear in	89
No L D bodies were found in the first but were foudh in the second spleen puncture smear in	3
No L D bodies were found in the spleen puncture smears but flagellates were grown from the material from the second spleen puncture in	3
No L D bodies were found in the spleen puncture smears but flagellates were grown from the material from the fourth spleen puncture in	1
The spleen was not palpable but flagellates were grown from the blood in	1
The spleen was not palpable but flagellates were grown from the liver puncture in	1
The first spleen puncture negative, but another spleen puncture being contra-indicated, treatment was commenced and a perfectly satisfactory result obtained in	2
	100

On the 14 cases that were diagnosed as *not* kala-azar spleen punctures were done as follows —

Cases in which one spleen puncture was done	1
" " two spleen punctures were done	8
" " three " " "	4
" " four " " "	1
	14

In each case one satisfactory culture was also done In a few of these cases a definite diagnosis was made, but most of them had to be classed amongst those obscure conditions of enlargement of the liver and spleen in which fever, if present, is due to some secondary cause and rapidly disappears These cases are clinically very like kala-azar, the blood picture is very suggestive of kala-azar but no parasites are found and the condition does not improve with antimony treatment

Out of 98 kala-azar patients in which a spleen puncture was done 9, or 9 18 per cent did not show L D bodies in their first spleen-puncture

smear We may therefore assume that one spleen puncture will give a positive result in 90 82 per cent cases of kala-azar

Other methods of demonstrating the presence of the parasites that were attempted were liver puncture and sternum puncture Each of these methods was tried on three cases, all definitely diagnosed kala-azar, with the following results —

Liver puncture "Positive"	1
" " "Negative"	2
Sternum puncture "Positive"	0
" " "Negative"	3

A definite opinion on the value of the two methods cannot be given on such a small number but the results are not encouraging

We do not examine the peripheral blood for parasites as a routine measure, as we do not consider that the time spent in searching is rapid by the results that are obtainable Major Knowles, examining the blood films from a number of these patients, found that by examining an average of 3 2 films from each case i.e was able to find the parasite in 19 3 per cent of cases

The result of the aldehyde test in these 100 kala-azar cases was as follows —

Aldehyde result	Number of cases	Comment
+ + +	52	81 Positive
+ +	21	
+	8	
(+)	12	Doubtful Prob-
(±)	4	ably positive
(-)	2	Doubtful Prob-
- ive	1	ably negative
		3 "Negative"

The result of the aldehyde test in the 14 non-kala-azar cases was —

Result	Number of cases
+ +	1
(-)	1
- ive	12

The one case that gave a positive result with the aldehyde reaction but in which no parasites were found was not a typical case of kala-azar, although the condition was suspected He had marked enlargement of the liver and slight enlargement of the spleen with irregular fever He was in hospital on and off for about six months but no satisfactory diagnosis was made

Comparing the value of the two methods of diagnosis, a single spleen puncture and the aldehyde reaction, we see that a positive and correct diagnosis was made in 89 cases by the former and in 81 by the latter method, but that a negative and incorrect diagnosis was made in 9 cases by the former and in only three cases by the latter method

Taking the nine cases of kala-azar in which a negative spleen puncture was obtained on the first occasion, we find that the aldehyde reactions were as follows —

Aldehyde reaction result	Number of cases	
+++	4	7 Positive
++	2	
(+)	1	
	2	Doubtful

Looking at these figures from another point of view we see that 81 out of 82 cases that gave a positive aldehyde reaction were cases of kala-azar but that of the 16 cases that gave a negative aldehyde reaction 3, or about 18 per cent, were also cases of kala-azar. Of the single spleen puncture findings all that show L, D bodies are *ipso facto* cases of kala-azar but of those that give a negative finding 9 out of 25, or 36 per cent, were also cases of kala-azar. It appears therefore that the aldehyde test gives rise to fewer incorrect results, than does a single spleen puncture.

About half the kala-azar cases give a very strongly positive aldehyde reaction, but the other half show a reaction of varying degree down to a "negative" reaction. This fact requires some explanation. At first we were under the impression that age had some influence on the type of reaction but this was soon found not to be the case. It is now clear that the reaction varies with the duration of the disease.

The mean of the duration of the disease in the kala-azar cases and the type of aldehyde reaction obtained are given below —

Aldehyde reaction	Number of cases	Mean duration of the disease in months
(a) +++	51	12.5
(b) ++	20	9.15
(c) +	8	4.75
(d) (+)	12	4.6
(or excluding one case that gave a duration of over two years)		
(e) (±)	4	2.8
(f) (—)	2	3.25
(g) —ive	1	1.75
		0.5

In these calculations periods of two years and over are counted as 24 months. In group (d) only one case gave a longer history than 5 months and she gave a history of over two years illness, kala-azar probably having been contracted during the course of some other illness.

The mean duration of the disease in non-kala-azar cases that give a negative aldehyde reaction was 15.7 months.

It would appear that as a general rule the reaction becomes doubtful during the third month of the disease and positive during the fifth

This demonstrates a very distinct limitation to the value of the test as it is in the early stages that the disease is so difficult to diagnose clinically, but at the same time the knowledge of this limitation puts us in a position to read much more intelligently the results of the aldehyde reaction. For example the duration of the disease in the three kala-azar cases that gave a negative aldehyde reaction was, respectively, 2 months, 6 weeks and 2 weeks, whereas the average for the 13 non-kala-azar cases which gave a negative aldehyde reaction was 15.7 months. Knowing the time that the condition on which the reaction is dependent takes to develop and allowing a small margin, we should be in a position to say that of these 16 cases those that gave a clear history of an illness longer than 6 months were not cases of kala-azar, whereas the others were possibly early cases of the disease. This would have meant that out of these 16 cases a definite diagnosis could have been made in 11 cases, leaving 5 cases, including the 3 in which L, D bodies were found, as doubtful.

To sum up the matter, the aldehyde reaction can be relied upon to give a definite and correct diagnosis in all cases whose illness has been of duration longer than 6 months, but in cases where the illness has been of shorter duration than 6 months only a positive diagnosis must be accepted as final. In the findings that we have analysed there is only one exception to this rule and the rule would have enabled us to make a definite and correct diagnosis in 92 out of 114 cases. These figures compare very favourably with those given by a single spleen puncture, where the fact that 9 per cent of kala-azar cases are liable not to show the parasites considerably decreases the value of a negative finding.

The Out-patients — The out-patient figures give much the same results but in this case a second spleen puncture was not done, the case usually being admitted into hospital if this was considered necessary. From the out-patient notes 239 cases were collected in which both the aldehyde test and spleen puncture were performed. In 131 of these L, D bodies were found in the spleen puncture smear and in the remaining 108 L, D bodies were not found. The aldehyde reactions were as follows —

Aldehyde reaction	Number of cases in which parasites were found	Number of cases in which parasites were not found
Positive { +++	67	6
{ ++	20	2
{ +	23	1
110		9
Doubtful { (+)	10	9
{ (±)	6	6
16		15
Negative { (—)	1	24
{ —ive	4	60
5		84
TOTAL	131	108

Of the 119 cases in which the aldehyde reaction was positive parasites were found at the first spleen puncture in 110 but we have previously shown that parasites are only found in the first spleen puncture smear in 90.8 per cent of kala-azar cases. Now 90.8 per cent of 119 is 108 or two less than the number of cases in which parasites were actually found, so that these figures strongly suggest that all the 119 cases were cases of kala-azar.

The same relationship between the degree of aldehyde reaction and the duration of the disease is apparent.

Aldehyde reaction	Number of cases	Mean duration of disease in months
(a) +++	67	11.63
(b) ++	19	9.32
(c) +	22	6.48
(d) (+)	10	4.7
(e) (±)	5	2.5
Excluding one case given a 3 years history		
(f) (-)	1	1
(g) -ive	4	2.375

Thus allowing for the error in diagnosis by a single spleen puncture the out-patient figures lead one to much the same conclusion with regard to the reliability of the aldehyde test in all but early cases of the disease.

BERGER'S STEREOSCOPIC LENSES FOR OPHTHALMIC PRACTICE

By E. A. R. NEWMAN,

LIEUT.-COL., I.M.S.

In the course of my wanderings I have recently had the pleasure of meeting Dr E. Berger, the inventor of the binocular lenses which bear his name, and who very kindly demonstrated their use to me. They are, I believe, practically unknown in India and as they present paramount advantages over the single magnifying glass, a short description of them may be of interest and value.

Briefly they consist of a pair of decentred convex lenses (crossed lenses), with an inclination towards one another in the horizontal plane and a slight inclination downwards in the vertical plane. They are mounted in either a vulcanite carrier (Fig 1) which is attachable to the head by a band or spring-strap or—still more conveniently—in a special reversible spectacle frame with a high bridge on one side and a low bridge on the other (Fig 2).

They were originally designed to replace the single magnifying lens in use in the watchmaking and engraving trades. With a single lens it is obvious that the retinal image of the unused eye is disregarded or suppressed in practice, with the result that the potential danger of functional amblyopia as a consequence of this suppression, becomes in time an accomplished fact in watchmakers for instance. The use of Berger's ap-

paratus not only prevents this danger, but by affording stereoscopic binocular vision gives a far

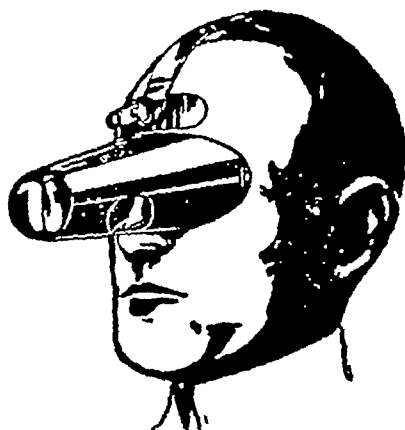


Fig 1—Dr Berger's stereoscopic lenses mounted in vulcanite carrier, as manufactured by E. B. Meyrowitzky 209, 5th Avenue, New York, U.S.A.
Price 6 dollars

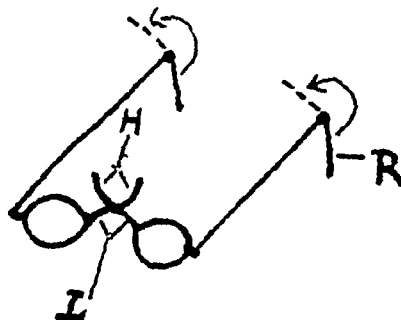


Fig 2—Berger's Reversible stereoscopic spectacle frame

L Low bridge
H High " "
R Reversible hinged arms

more vivid picture of an object under inspection than is possible with a single lens. The effect, indeed, of this stereoscopic picture with its clear delineation of surface inequalities and the accurate estimation of comparative distances of the different portions of the object under inspection, must be seen to be fully realized. In addition the prismatic effect of the decentred lenses abolishes the necessity for convergence and thus saves the strain produced by prolonged convergent efforts of the extra-ocular muscles. In consequence users of Berger's lenses testify to the greater comfort and decreased fatigue experienced from their use. Though originally designed for use in the finer mechanical trades and the fine arts, they are no less useful in many other callings and have been increasingly employed by many distinguished physicists, physiologists and other laboratory workers in Europe since their introduction more than 20 years ago.*

* Amongst others Professor Lippman, Professor Ramon y-Cajal and Dr Charles Edward Guillemin, all Nobel prize winners for researches in Physics, have recommended them highly.

From a medical point of view their chief application lies in the domain of ophthalmology. A distinguished ophthalmic surgeon has recorded his opinion that Berger's spectacles are as necessary for the examination of the anterior portion of the globe, as the ophthalmoscope is for the examination of the fundus. The briefest trial suffices to confirm the truth of his dictum. Not only do they afford an extraordinarily vivid picture of the cornea, iris and pupil but also enable

springing into clear relief. I have not had an opportunity of performing a cataract extraction with Berger's spectacles, but I can easily realize with what increased ease and certainty the counterpuncture could be placed or an elusive tag of residual capsule could be grasped with the capsule forceps.

The double spectacle frame is peculiarly well adapted to the requirements of the ophthalmic surgeon. (Fig 2)



Fig 3 —Berger's Stereoscopic Spectacles with the high bridge in use for direct visual examination



Fig 4 —Berger's Stereoscopic Spectacles with the low bridge in use for eye operations

an immediate estimation to be made of the localization of any lesion, the depth of the anterior chamber or abnormalities of the pupil, etc. With a single lens and focal illumination, it is often by no means easy to determine whether an opacity is situated on the surface of the cornea or behind it, even with the most careful examination. With Berger's lenses the difficulty is immediately solved, the relative depth and situation

The high bridge is necessary for direct visual examination with the patient in a standing or sitting posture (Fig 3), the low one is equally well adapted for cataract extraction or other eye operations with the patient in a recumbent position (Fig 4).

In practice two warnings are necessary (1) The spectacles must be worn low down on the nose for the production of the full stereoscopic

effect, and (2) if the user has any definite error of refraction he must of course wear his own correcting glasses at the same time

Dr Berger's lenses are made in varying strengths according to the frame or carrier in which they are mounted. Glasses of + 10 D are standard in the spectacle frames. The focal length of 4 inches is, however, too short for convenience in ophthalmic practice and when ordering them, lenses of + 5 D should be specified. Such lenses have a focal length of 8 inches, and afford a distance of roughly 10 inches between the observer's and the observed eye, which is a convenient distance. The visual field is also somewhat larger with the weaker glasses. The degree of convergence they afford is equal to that of a prism of 2 degrees placed before either eye, or 4 degrees in all. They are equally useful to the dermatologist though for this purpose higher powers are preferable.

Berger's glasses mounted in spectacle frames are obtainable from Messrs Stuchling et Cie, 29, Quai de Bergues, Geneva, Switzerland, for 12 francs (Swiss) or say Rs 9, which should cover postage, etc.

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THE SURGICAL TREATMENT OF CHRONIC DYSPEPSIA

By E W C BRADFIELD, M.S., F.R.C.S.,
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A paper read before the South India Branch of the British Medical Association

In January 1922 with the approval of the Superintendent and the Senior Physician it was arranged that all patients suffering from symptoms of chronic dyspepsia should be referred to and seen by me in the Out-Patient Department and when advisable admitted direct to the Surgical wards. During the past 11 months a very large number of patients have been seen by myself and by Mr Matnew, the Surgical Registrar of the Hospital, to whom also I am very much indebted for help in preparing this paper.

Excluding a number of chronic dysenteries, patients suffering from the effects of intestinal parasites, and others who refused hospital treatment, the surgical work which has been done in my wards is shown in the table. The results are neither especially good nor bad, but as I hope to show are very similar to those which have been reported from other clinics. Many cases have been admitted under the other surgeons of the hospital but have not been included as I have no personal experience of them.

The list only includes appendix and other lesions where symptoms have been mainly gastric, and where the operation has of necessity included exploration of the stomach and duodenum for a possible ulcer.

The fact that more than 80 cases of chronic

ulcer of the stomach and duodenum have been treated surgically during the last ten months is evidence that these are very common diseases in

	Cases	Deaths	Operation mortality
Gastro-enterostomy—			
For Pyloric ulcer	16	0	0
For Duodenal ulcer	61	6	9.8
For Gastric ulcer	1	0	0
For Perigastritis	2	1	50%
Total	80	7	8.5%
Gastrectomies—			
Partial for ulcer	2	1	50%
Do for carcinoma	1	1	100%
Do for sarcoma	1	1	100%
Excision of ulcer (Bul four's)	2	1	50%
Chronic appendicitis—			
Appendicectomy	8	0	0
Do with division of bands	5	0	0
For Mobile colon—			
Colopexy with appendicectomy	8	0	0
For Gall Stones—			
Cholecystectomy	1	1	100%
Cholecystectomy	2	0	0
Hydatid disease of liver—			
Excision of hydatid	1	1	100%
Stricture of ileo caecal valve—			
Clectomy	1	0	0
TOTAL ALL CASES	11	13	11.6%

Madras and suggests that a review of the special features which they present is worth while.

The symptoms of duodenal ulcer may be so definite that the diagnosis can often be made upon the history alone and with more accuracy than in any other abdominal disease which comes under the care of the surgeon. The patient has more or less typical attacks of pain, usually of two or three weeks duration and separated by intervals of perfect health, often for months. Exposure, overwork or indiscretion in diet, precipitate these attacks. Pain comes on two or three hours after food, lasts till the next meal and is relieved by it, often it is very severe and troublesome at night. Physical examination may reveal rigidity and tenderness of the right rectus, or nothing, and there may be no delay in the emptying of the stomach.

In other cases the pain is not so typical, especially if the ulcer is on the posterior surface. Pain may begin an hour after food suggesting a gastric ulcer, or may be very irregular, even simulating biliary colic, or a chronic appendicitis. The recurrent nature of the attacks is important, and the X-ray picture after the bismuth meal will give great help, but often it is impossible to arrive at a true diagnosis except at the operation, which in cases of almost identical symptoms may reveal in one a chronic duodenal ulcer and in another chronic appendicitis only.

With the onset of complications, extension on the posterior surface, stenosis, the result of contraction of the scar or of adhesions, there may be no remissions, pain is almost constant, especially at night and aggravated by food, while the presence of visible peristalsis may render the diagnosis easy

Few of our patients come under the first two groups, two showed more or less typical attacks of recurring pain, while the difficulty of diagnosing the second group is shown by the number of operations included in the table for other conditions. A very common history for these patients to give is that they had attacks of pain, extending over many years, but that for the last three or six months it had been worse, and quite prevented them from following their occupation. Out of 51 patients in no less than 31 was active peristalsis visible on inspection of the abdomen, showing either that actual stenosis was present, or that there was marked spasm due to the presence of an advanced ulcer. 42 said that they relieved their pain by inducing vomiting, but vomiting relieves pain in many dyspeptic conditions. The duration of symptoms in all cases is shown in the following table, and though it has been of great value in diagnosis I would never wait for such long periods before advocating surgical measures, which in early cases give an operative mortality of less than 2 per cent, but entail a greater risk when the patient is weak and debilitated from the chronic starvation of a stenosis

Duration of Symptoms

	Number	Average duration	Maximum	Minimum
		yr	yr	yr
Pyloric	16	4.2	10	$\frac{1}{2}$
Duodenal	53	4.1	20	$\frac{1}{2}$
Gastric	5	2.8	5	1
Cancer	1		1.5	
Mobile colon	7	4.4	10	$\frac{1}{2}$
Appendix	13	2.3	12	$\frac{1}{2}$

The important characteristic of gastric ulcers is the absence of symptoms during long intervals. Though we have been able to elicit epigastric tenderness in practically all our cases, its position seemed to bear no definite relation to the site of the ulcer and I think the finding of tenderness, either superficial or deep gives very little real diagnostic help. With the onset of complications, a chronic perforation or the formation of a stricture, symptoms become constant and the disease more obvious. Visible peristalsis was present in 13 out of 15 pyloric ulcers and in 3 out of 4 ulcers of the stomach. Flint (1) of Leeds in a recent paper writes "it is true that a clinical diagnosis of gastric ulcer is wrong in nearly two cases out of three. It is computed that 60 per cent of gastric disturbances owe their origin to a source outside the stomach and Sir Berkley-Moynihan's epigram that the commonest site of

a gastric ulcer is in the right iliac fossa, should be constantly in the mind of every one who thinks rashly that he can diagnose one in the stomach."

There are only two ways in which a certain diagnosis can be made during life (1) by a positive X-ray finding or (2) by operation.

In all our gastric work we have had very valuable help from Capt Barnard and the now up-to-date Radiology department at the hospital. I have not summarised these results but briefly X-rays may show either—

- 1 Delay in the passage of the bismuth meal
- 2 A demonstration of the ulcer cavity
- 3 The indirect sign, or the spasm caused by the ulcer

The bismuth meal must be given on an empty stomach and though the emptying time of the normal stomach varies considerably, we estimate that if over one-third of the opaque material is left in the stomach at the end of six hours, it is definitely abnormal. If an ulcer has penetrated the stomach wall, or perhaps further into the liver or pancreas the ulcer cavity can be seen filled with the bismuth. In duodenal ulcer the duodenal cap or first part can often be seen to be irregular, while sometimes actual stricture of the pylorus can be seen. A notch on the greater curvature due to gastric spasm may be seen but may also occur in disease of the appendix, caecum, or gall bladder.

The notch, which is due to spasmodic contraction of the circular fibres of the stomach, occurs usually opposite the ulcer and causes an indentation of the greater curvature. Its presence is strongly suggestive of gastric disease and if a projection on the lesser curvature is also evident a diagnosis of gastric ulcer is practically certain. A negative X-ray does not exclude the presence of an ulcer.

The site of the ulcer in the cases under review was as follows—Duodenum first part 54, second part (really at junction of first and second parts) 7, pylorus 15, lesser curvature of stomach 3, posterior surface of stomach 1. In two patients two separate chronic ulcers were found, an ulcer of the first part of the duodenum being combined with an excavated ulcer of the lesser curvature in one and an ulcer near the pylorus in the other. That is of 82 ulcers, 69 were situated at or in the region of the pylorus. A remarkable specimen is shown from a patient too ill for operation and who died shortly after admission from acute dilatation of the stomach, in which there is a large ulcer on the lesser curvature, multiple ulceration of the first part of the duodenum, and a dense stricture, due to ulcer, which hardly admitted a probe just below the opening of the common bile duct. All except one of our ulcer patients were males.

Appendix. Chronic diseases of the Appendix may produce symptoms practically indistinguishable from gastric disease, the so-called appendix dyspepsia. All except three of our patients have

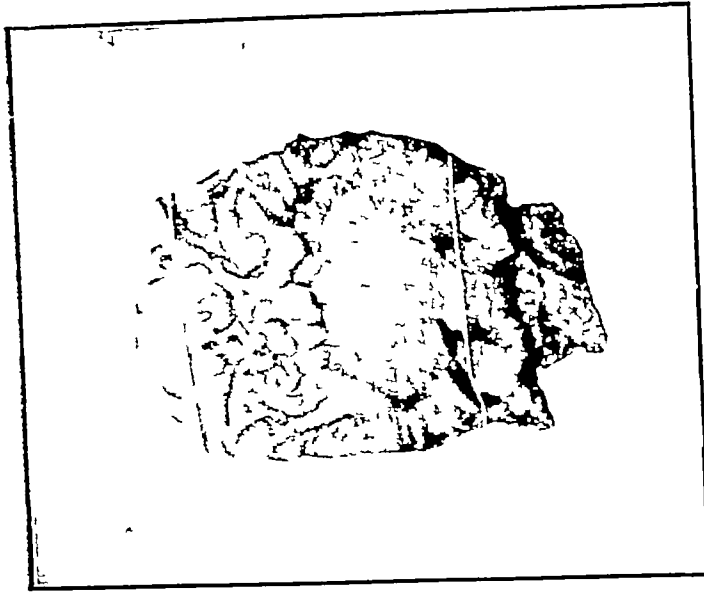


Fig 1 — Carcinoma of pylorus. Large crateriform ulcer with hard raised ulcerated edges. Duration of symptoms 18 months. Partial gastrectomy (Pylorotomy).

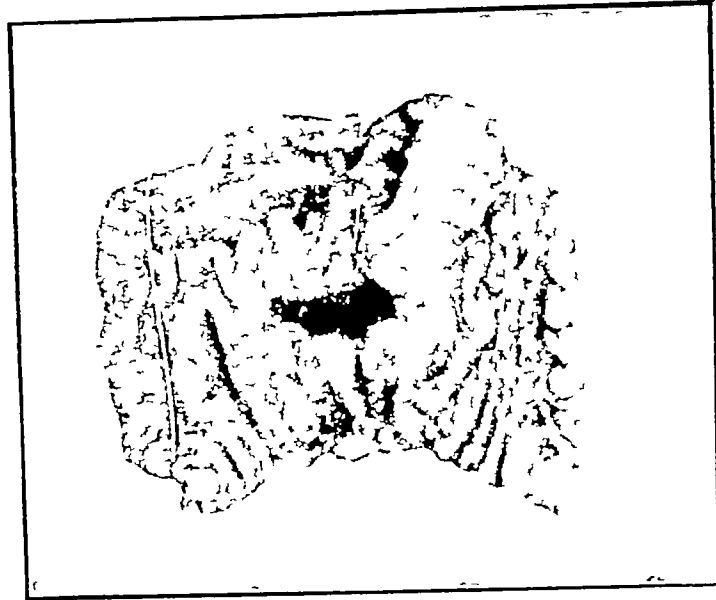


Fig 2 — Chronic ulcer of posterior surface of stomach. Duration of symptoms 5 years. Partial gastrectomy.

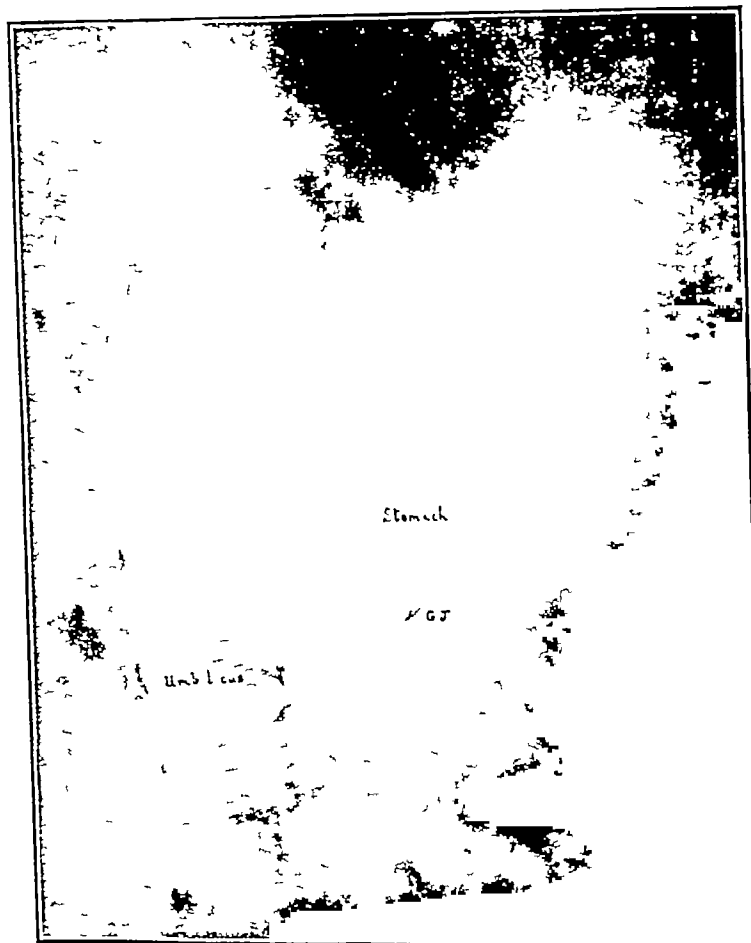


Fig 3 — Patient operated on 6 months previously for Duodena ulcer. Gastro-jejunostomy performed. Examination $\frac{1}{2}$ hour after the Bismuth meal. Radiograph shows the Bismuth passing through the Gastro-jejunostomy opening. Nil passing through pylorus. G J = Gastro-jejunostomy.

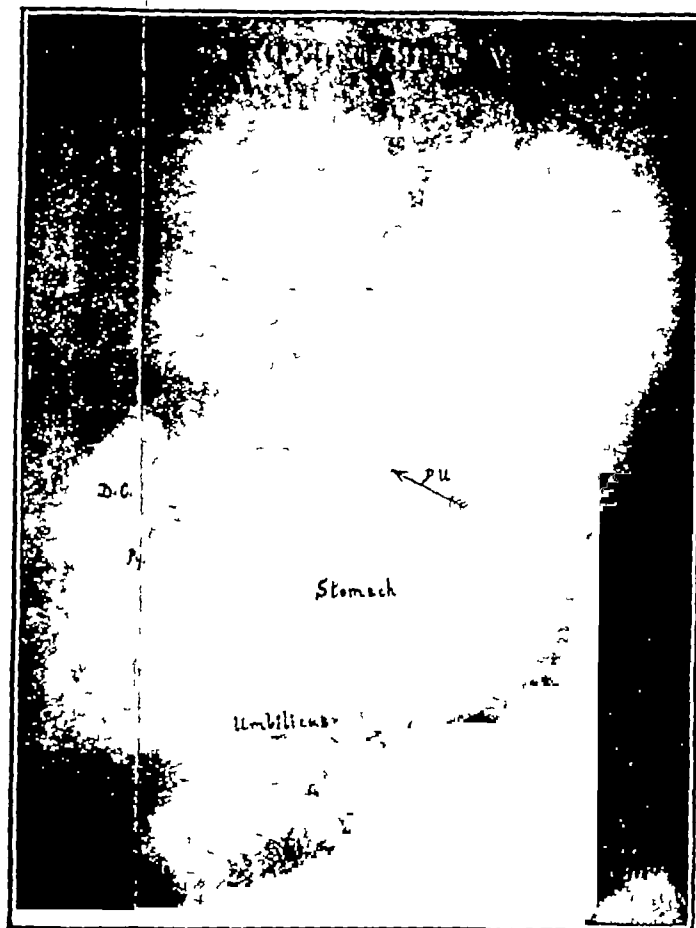


Fig 4 — Examination $\frac{1}{2}$ hour after Bismuth meal Radiograph shows a penetrating ulcer on the lesser curvature
P U = Penetrating ulcer
Py. = Pylorus
D C = Duodenal cap

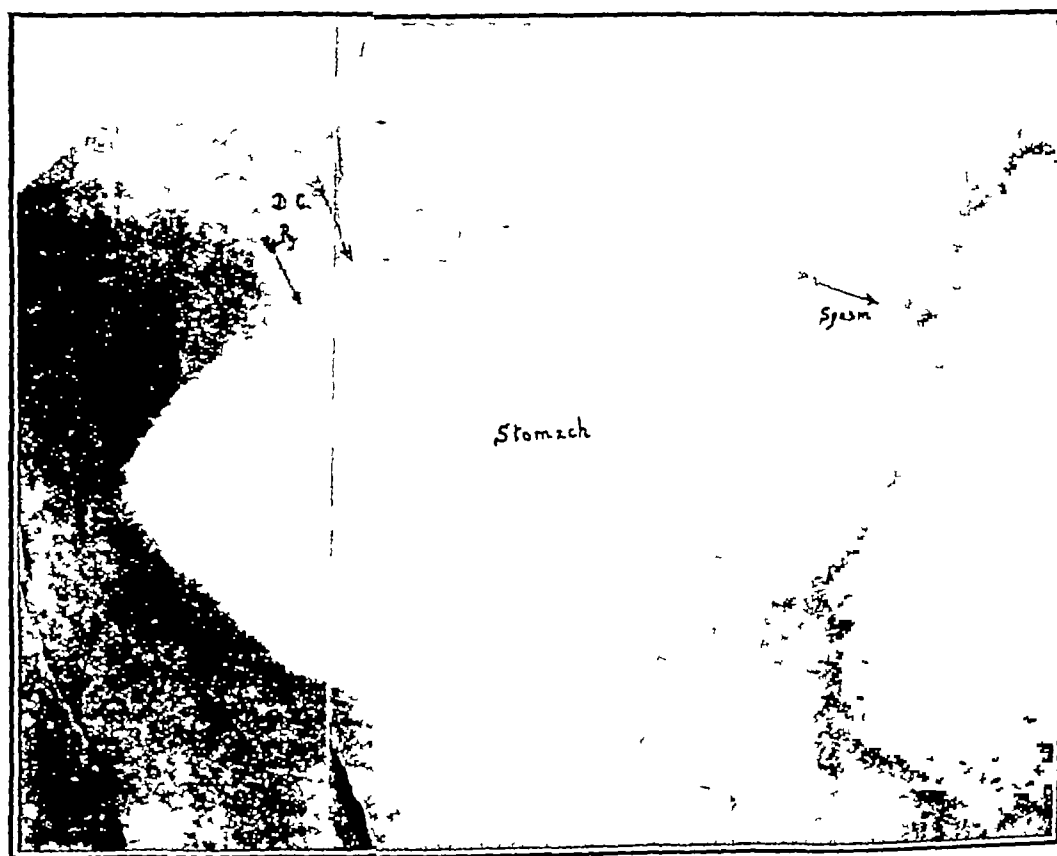


Fig 5 — Examination 6 hours after the Bismuth meal Radiograph shows (1) practically no Bismuth had passed out of the stomach (2) a spasm on the greater curvature (which was present at the first three examinations) (3) an irregular Duodenal Cap and Pylorus
Duodenal ulcer found at operation
D C = Duodenal cap
Py = Pylorus

been Indians and the pathological condition found has been described as chronic catarrhal, ulcerated, fibrous and obliterated while one appendix contained a thread-worm. Removal of the appendix has entirely relieved the gastric symptoms of all, except two very much improved who are still under observation and who are extremely neurasthenic the result of symptoms of dyspepsia extending over many years.

One case is remarkable. This was referred to me by Colonel Elwes, and in this patient removal of an appendix had an immediate effect on the temperature and the patient's general condition, which rapidly improved and lost its toxic character. Only the appendix was removed and on microscopic examination this was found to be normal.

The exact meaning of these diseased appendices, which rarely go to acute appendicitis is a little puzzling, for similar conditions can often be seen in the post-mortem room, where apparently there have been no symptoms. That they do cause symptoms is shown by the effect of their removal, and it is possible that they constitute a latent source of infection in the same way as the focal abscesses which we so often find in connection with the teeth. The influence of the thread-worm among a population, 60-70 per cent whom are infected, is also a subject for discussion.

Associated with diseased appendices in 5 cases were definite bands which were divided, another abdominal condition which may cause obscure gastric symptoms and the description of which we owe primarily to Lane's work on intestinal stasis.

A diagram is shown of a common band, the ileal or Lane's kink. Another frequent band runs over the ascending colon, often in connection with a Jackson's membrane (membranous pericolicitis).

This latter is a thin membrane or vascular veil spreading from the parietal margin over the ascending colon, often containing thin blood vessels, and looking something like an oedematous arachnoid. These bands and membranes are now considered to be congenital in origin, formed as folds of a peritoneum during the rotation of the primitive mesentery. It is not certain how they produce symptoms, possibly by twisting the gut or actual stenosis or they may cause interference with the ileo-caecal mechanism.

Mobile Colon—Vaugh, discussing the effects of a mobile colon points out that abdominal diseases are largely grouped in the right upper abdomen and considers that their incidence is largely caused by an over-loaded ascending colon.

The normal ascending colon has no mesentery and when full its weight is in consequence diffused over a wide area. In a certain number of people its primitive mesentery persists, and in consequence the colon, the only part of the alimentary canal which has to force semi solid-fluid upwards against gravity, is working at a disadvantage and there is great mechanical inefficiency. The weight of an overloaded colon is then distributed

along a narrow line of the posterior attachment of the mesentery and in consequence strain is thrown upon the right kidney, duodenum and by radiation, upon the pyloric end of the stomach. The colon may even prolapse into the pelvis, causing sudden and unexplained attacks of pain. The pain produced though constant in type and location is erratic and irregular in its time of appearance, and may be gastric, duodenal, renal, or right iliac in its character. The appendix is often involved, it seems to me, by the constant back pressure of a chronic constipation. We know that some patients with chronic appendicitis, especially where the symptoms are mainly dyspeptic, are not cured by its removal. Fixing the ascending colon to the posterior wall seems to give excellent results in these cases. The procedure at operation is to prepare a bed by clearing the psoas and quadratus muscles, and a flap of peritoneum is closed over the colon to fix and bury it.

The results of our treatment, and the condition found at operation form the most interesting part of this investigation, and give us I think hints as to the possible causation of gastric and duodenal ulcer and suggestions for future treatment.

Operation Mortality—The operative mortality, 8.5 per cent for gastro-enterostomy, at first sounds very high when compared with the recent figures of Moynihan and other famous surgeons. Their statistics are, however, based on the treatment of patients seen earlier and which have not reached the desperate condition of many of our patients, to whom the surgical risk is a big one. Our figures should be more fairly compared with the earlier days of gastric surgery when it was a big adventure for the patient to have his stomach opened and when gastric ulcers were handed over to the surgeon late. The only recent figures I have been able to find which can be compared with ours (*ie*, operation for stenosis) in India are a comparative study by Hartmann². Of 36 cases of stenosis sent him by two physicians, who were partisans of early interference there was only one death, a mortality of 2.8 per cent, whilst of twenty-four patients referred to him by other physicians, who had temporised, there were nine deaths, a mortality of 37 per cent.

The cause of death in the cases under review was as follows—

Gastro-enterostomy
for Ulcer

6 Pneumonia 4, on the 3, 5, 6 and 8th day after operation
Heart failure 1, a man aged 70, who was doing very well but died suddenly on the 5th day of heart failure while talking to his relatives.
Tubercle of lung 1

Gastrectomy

3 Shock 2, in both malignant cases

Excision of Ulcer

Peritonitis with pneumonia 1
Shock 1 A desperate case

Perigastritis

Abscess of liver 1 Died suddenly on the 25th day Abscess of the liver was never suspected at the operation or after and a gastro-enterostomy had entirely relieved his symptoms

Cholecystotomy

A single gall stone which had caused severe gastric symptoms in an Indian and who died some 20 days after operation from tubercle of lung

That is death was due to pneumonia in 4 cases, tuberculosis 2, peritonitis 1, shock 4, heart failure 1 These results are, I think, not discouraging but rather an argument for earlier surgical treatment All the duodenal patients who died had very advanced stenosis, so advanced that the stricture would not admit an ordinary lead pencil, while the gastrectomy patients were all very ill and very bad surgical risks It is difficult to refuse surgical treatment to this type of patient, for they are suffering from a mechanical obstruction which nothing but surgery can relieve

The following table shows the principal post-operative complications which occurred

		Gastric cases	Gall Bladder	Colo-pexy	Appendicectomy
Total cases	104	80	3	8	13
Acute Bronchitis		3		1	3
Pneumonia	11=13 7%				
Heart failure		1			
Orchitis (Result of catheterisation)		1			1
Malaria		3			"
Gastro-jejunal ulcer		1			
Acute dilatation of stomach		1			
Post anæsthetic paralysis		1		1	1

The frequency of pneumonia after operations on the upper abdomen has caused us very considerable anxiety I risked the health and temper of the staff by operating without fans in the hot weather, and we obtained some real improvement with this and when we did away with the mechanical punkas of the post-operation ward Keeping the patient warm and dry during the operation is a most important precaution, but pneumonia to which these patients are very liable is a real danger Some of these lung complications are probably tuberculous in nature

The anæsthetic is another dread and the use of chloroform adds to the risks of operation The use of a chart on which the pulse, respiration and blood pressure is noted, is of great help, and gives one timely warning, but until we get rid of the idea that any one can give an anæsthetic, and until the anæsthetist's appointment ceases to be a stepping stone to others, the anæsthetic will always be a source of anxiety to the surgeon In most operations novocaine has been injected locally with a minimum of general anæsthesia and I hope we

will soon be able to substitute the safer gas and oxygen method for chloroform

One case of acute dilatation of the stomach nearly ended in tragedy, but we opened the abdomen again and rectified the cause of obstruction, though the pulse went up to 160 he made a rapid and uneventful recovery Jejunal ulcer is said to occur after about 2 per cent of these operations In one of our early ones the opening was smaller than I generally make, since enlarging the stoma and removing the appendix at a subsequent operation the patient has done very well

It is too early to determine the permanent results of these operations Though all our patients have left hospital extremely pleased with themselves and apparently cured, I must be content to quote the figures of other surgeons In duodenal ulcer, gastro-enterostomy is followed by a cure in at least 80 per cent Sherren^a says 90 per cent, and great improvement in 80 per cent of the remainder

In gastric ulcer, the cures vary from 75 per cent to 80 per cent while the rate is even higher after partial gastrectomy

We wrote to 50 of our patients who have been operated on more than 6 months previously and 17 replies have been received

Appendicectomy	1 quite well, cured
Gall stones	1 completely cured
Gastro-enterostomy with appendicectomy	9 completely cured, very happy and can do any work, 2 no pain or trouble but not yet strong enough to do heavy work
Colopexy	3 completely cured
Excision of ulcer	1 died 3 months after operation No cause given. Left hospital very well and apparently cured

The operation where symptoms are of long standing acts like a charm, and since these patients are frequently decoys for other sufferers it becomes very necessary that we should make an accurate diagnosis during the operation, for the results of gastro-enterostomy where no ulcer is present are lamentable Many of these patients have a very dilated stomach which has completely lost its tone, and takes some time to recover We are trying electrical massage on several now with very promising results

The appendix has been removed as a routine, except in desperate cases where very rapid operating was necessary The pathological report of 68 of these appendices is as follows —

Normal 23, chronic inflammatory 21, catarrhal inflammation 10, obliterative appendicitis 7, ulcer 1, thread-worm with chronic inflammation 4, round-worm 1 That is, there is a pathological lesion in 66 per cent, while of 23 normal appendices 9 were noted at the operation to be retro-cæcal and kinked

The condition of the ascending colon, and the presence of bands has been noted at operation in 47 cases A mobile colon, with mesentery was present in 30 cases, 63 per cent (21 duodenal,

9 pyloric), a Jackson's membrane in 7, an ileal kink in 4, and a band over the ascending colon in 8

All recent theories of the causation of gastric ulcers tend to show that it is an infective lesion secondary to a focus elsewhere. Rosenow's experiments in this respect are more than suggestive. He isolated streptococci from the base of a gastric ulcer and found that when he injected them into the blood stream of another animal of the same species similar lesions were produced. Diseases of the gall bladder and appendix can be reproduced in exactly the same way, but his experiments have gone further for he found that by altering the virulence of the organisms, streptococci obtained from a diseased appendix and injected into the blood stream could produce not an appendicular lesion, but necrosis of the gastric tissues.

Experimentally produced ulcers tend to heal rapidly but healing can be delayed by increasing the acidity of the gastric juice and by inducing an artificial pyloric stenosis though no extension of the ulcer results. Gastro-enterostomy overcomes both these faults.

In 66 per cent of our patients the appendix was diseased. It is possible that the mobile colon with its accompanying chronic constipation is a cause of this and that both together by causing first passive congestion and then infection in the pyloric region and stomach cause the gastric ulcer?

Teeth are another source of infection and frequently cause gastritis as we all know. In 66 patients or 82 per cent. the teeth were definitely noted as being infected with pyorrhœa or so dirty as to be a source of infection.

I think we are all agreed that medical treatment should first be attempted in the early stages of these ulcers and that with it many patients will be cured, if they will take the time and necessary trouble. Medical treatment is, however, often inefficient, and few patients will carry out the restricted diet and rest that is necessary. Moynihan says of medical cure "for the rich it is possible, for the poor it is hardly to be attained." The question when to recommend operation is largely an economic one. When symptoms, however, are continuous and suggest the onset of complications, operation is the only treatment that can really bring relief. In other and earlier cases, if medical treatment fails to bring relief within reasonable time, or if relapses, a feature of these ulcers, occur then operation is indicated, and if performed early the mortality rate will be negligible.

Treatment must in all cases include careful attention to the mouth and pharynx and the appendix is an organ which requires our careful consideration. The hang-at-sight policy or removal whenever an opportunity presents itself, is one to be followed.

I am much indebted to Captain Barnard,

Radiologist, General Hospital for the photographs and X-ray photographs

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A SHORT NOTE CONCERNING A NEW METHOD OF TREATMENT FOR INOPERABLE CANCER

By Dr S MALLANNAH, M.D.,
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Hanau in 1889 transmitted cancer from one animal to another and Morau in 1894. It was Jensen, however, who proved conclusively in 1903 that cancer is communicable to mice and that the infective material is the living cell itself.

Many attempts have been made to produce immunity against cancer in animals. Bowdon in 1905 ligatured the vessels supplying the tumour and obtained necrosis of such growths but it had no effect on other tumours in the same animal. In 1906 Schone used injections of emulsions of normal foetal and adult animal tissues without success. In 1908 Bashford, Murray and Cramer used injections of normal blood corpuscles into mice and produced temporary immunity, but later found these injections useless, as the immunity quickly disappears and as it does not increase by repeated injections. Coca and Gilman in 1909 used emulsions and extracts of cancer growths for the cure of cancer but in some cases tumours formed at the site of injection. In these experiments tulol, chloroform and phenyl were used as preservatives. Haaland, 1910, has proved that the mechanical disintegration of tumour cells does not produce immunity when injected. In 1910 Contamin showed that inoculation of tumour material exposed to X-rays produces immunity in some cases, and excessive radiation on the other hand does not produce immunity. In 1914 Wedd, Morson and Russ produced immunity in mice against sarcoma with tumour material exposed to radium, when injected. Kellock, Chambers and Russ between November 1920 and June 1921 treated 12 cases of malignant growths with tumour material exposed to the lethal dose of X-ray radiation and obtained successful results in 5 cases out of 12, but tumours formed at the site of injection in 5 other cases out of 12. It is fair to mention here that in all these successful cases, the primary growth was removed by operation, leaving only the axillary glands behind. After the removal of the breast tumour, the wound was closed and dressed. Two fan-shaped pockets were made in the abdominal wall on each side of the median line with the narrow end upwards. The

growth removed was cut up with scissors and minced in a metal mincing machine and exposed to X-rays before it was introduced again into the abdominal pockets by an all-glass syringe, fitted with a wide aperture and cannula. The preparation of the material takes 2 hours. The quantity of material injected requires to be more than 8 c cms.

In certain diseases where the cause is not known the remedy has been found in the infected material itself, as in the case of hydrophobia, and this remedy is used with success.

Is it not possible then to prepare a similar agent for the cure of cancer? I took a specimen of epithelioma of the lip removed six months previously and kept in rectified spirit for that period from a pathological museum. After removing the spirit the growth was found to be very friable. A piece of growth was taken in a sterile Petri dish and after the spirit had completely evaporated, was pounded in a sterile mortar and converted into a fine powder. This powder was used for the treatment of cancer.

A patient named Kasim Bai aged 60, suffering from epithelioma, was given subcutaneously $\frac{1}{4}$ grain of this powder suspended in sterile saline solution into her right forearm on 5th December, 1907 at Dodbavli Dispensary. She had a typical cauliflower growth on the inner side of the cheek on the right side measuring $1\frac{1}{2}$ inches by $\frac{1}{2}$ inch. There was enlargement of two lymphatic glands under the jaw in the right submaxillary region. Both were hard in consistence. The duration of disease was given as three months. Microscopically the growth was one of squamous epithelioma. Next day I was frightened to find her whole forearm immensely swollen, dark red in colour and much inflamed. It looked as if I had given her cancer in her forearm. But when I noticed her cheek I was pleased. There was a red flush on her infected cheek, a reactionary inflammation similar to that found around lupus when after tuberculin injections. I knew it was a focal reaction and it meant that the remedy was producing a specific action on the diseased part.

Within a week the swelling in the forearm completely subsided and the growth was seen disintegrating, a portion having sloughed away. After a fortnight a second injection was given with the result that the whole growth completely sloughed away leaving a clear ulcer behind. The glands became soft and were about to burst. After another fortnight, a third injection was given, the glands suppurated and opened by themselves. There was free discharge of a purulent fluid. A fortnight after the fourth injection the patient seemed completely cured but as I was not able to trace her afterwards, I could not use the word cure in the strict sense in this case. The result is

so remarkable that it cannot be attributed to mere coincidence, especially as the occurrence of reaction was so characteristic. Afterwards on account of my transfer I was not able to carry out these experiments. When I did get an opportunity at Afzalgunj Hospital I found other difficulties to cope with. Patients would not remain long for treatment. I treated two cases at the Afzalgunj Hospital. A patient named Janki Bai, aged 50, suffering from a fungating growth of the left breast, was admitted into the Afzalgunj Hospital. The growth was as big as a cricket ball and had ulcerated on account of the application of local remedies. It was very vascular. There was no nipple left. In the left axilla there were enlargement of three lymphatic glands, the size of soap nuts. The patient was anæmic and had an unhealthy appearance. The duration of disease was six months. On microscopic examination the growth was found to be a case of scirrhus-encephaloid cancer. On 13-10-20, $\frac{1}{4}$ grain of cancer substance treated and kept in alcohol was given subcutaneously into the left arm. On 14-10-20, there was an inflammatory swelling at the site of injection in the left arm. There was also a red inflammatory zone around the growth especially at the upper margin.

19-10-20 The growth seemed to be red and inflamed.

21-10-20 Second injection of cancer vaccine (1 grain) was given subcutaneously in the right arm.

29-10-20 The growth seemed a little smaller.

1-11-20 Third injection of vaccine was given.

4-11-20 Growth became distinctly smaller.

8-11-20 As patient left hospital unexpectedly, the treatment was discontinued.

A patient named Mohedeen Bai, aged 55, was admitted into the Afzalgunj Hospital for cancer of the left breast with enlargement of the axillary glands. As she was suffering from general anasarca and looked very ill, she was not considered a good case for operation. Under chloroform three-quarters of the growth was removed leaving a quarter behind, together with enlarged glands in the axilla and the wound was stitched up.

On 22-10-21 Cancer vaccine prepared from the patient was given subcutaneously ($\frac{1}{4}$ gr).

On 24-10-21 Inflammatory zone round the glands was noticed.

On 25-10-21 Second injection of vaccine was given ($\frac{1}{4}$ grain).

On 28-10-21 A third injection was given ($\frac{1}{4}$ grain). As she was suffering from anasarca and as she had albumen and casts in the urine she was put on to thiosine sodium acetate and digitalis from the very beginning. As a result there was a great improvement in the dropsy.

On 6-11-21 A fourth injection was given Glands became distinctly smaller

12-11-21 Not only did the dropsy completely disappear but the urine also became quite free from albumen and casts

There was hardly any gland palpable in the axilla As the patient left the hospital unexpectedly one cannot say whether the case was cured There was no doubt about the absorption of the remaining growth together with the enlarged glands As the powder is not at all soluble I tried various substances to see which would dissolve it best I tried glycerine, saline solution, carbolic solution, serum and caustic soda and found the last to be the best but unfortunately it had no beneficial effects on the growth Further experiments are being tried

A Mirror of Hospital Practice.

A CASE OF QUINTUPLETS

By Miss RUTH E. VEFRANA,
King Edward Memorial Hospital Rohtak Punjab

A BRAHMINI woman aged 30 years, from a village Jaunti, in the Delhi District (27 miles from Rohtak, and 4 miles from a railway station) was admitted to the King Edward Memorial Hospital Rohtak Punjab, on November 21st, 1922, late in the afternoon complaining of very great distension of the abdomen the weight of which was so great that for the last six weeks she had to stay in bed She had no appetite little sleep, great discomfort and swelling of the legs and feet She also said that she was pregnant "full term" that a week ago for two days and two nights she had severe labour pains which gradually subsided without any result

Previous history Has had three children, aged 13, 10, and 1 year and 9 months respectively All normal labours Last menses ceased in March, she cannot tell whether it was the beginning, middle, or end of the month In the fourth month of pregnancy, the patient and her neighbours noticed that her abdomen was unusually big, and often remarked about it, although the patient felt nothing unusual except her size The size and weight increased steadily, and she felt that she could not walk with ease Her household work became a burden to her, and on account of the weight, and swelling of the legs and feet she had to take to her bed Foetal movements were not so strong as before, although she still felt them

Physical examination—Patient looks very worn out, thin and exhausted, but not ill

Tongue—Thinly coated, not dry Bowels constipated No trouble in passing urine Heart and lungs normal Pulse slow, about 70 per minute

Abdomen—On inspection looks exactly like a case of huge ovarian tumour, the largest diameter being from the xiphoid cartilage to the symphysis pubis The case seems to be one of normal pregnancy Abdominal walls very thin and stretched

On palpation—Feels very hard and solid especially on the right side on the left side some irregularity is felt? Limbs of foetus movements are felt, but not marked. Very slight fluid wave felt

Percussion—Dull all over

Auscultation—On the right side, above the umbilicus foetal heart sounds heard, not very distinctly, but on the left side between the umbilicus and the superior iliac spine foetal heart sounds are distinctly heard Uterine souffles not heard distinctly

Generative organs—The whole of the pelvic floor was bulging, the vaginal outlet somewhat open, anterior and posterior vaginal walls can be seen, pressure on rectum, (no oedema)

Per Vaginam—Vagina spacious External os is very soft and patulous (size a little more than a rupee), could easily be dilated, head of the foetus presenting, and low down in the vagina Bag of membranes not ruptured, though not bulging nor very thick

The diagnosis was very puzzling

1 Was it a case of twin pregnancy? Or —
2 Pregnancy complicated with hydramnios?

1 If a case of twin pregnancy, the shape of the uterus was against it, the second foetal heart sounds were not very distinct, and the enormous size did not correspond with twins only

2 With regard to hydramnios there was no fluid thrill, and per vaginam the bag membranes were not bulging

The pains that the patient had had a week previously I felt sure were labour pains, but owing to over-distension of the uterus, she was unable to expel the foetus

Treatment—November 21st, 1922

An enema was given, and a catheter passed

Mag sulph oz iv, was given by the mouth, and the patient left to rest, as she had come a long journey At 9 p.m. I visited her again, and asked her if she was in any extra discomfort since admission But on being assured that she felt no worse she was left for the night

November 22nd, 1922—In the morning at 8 a.m. the condition of the patient was the same as before I made up my mind to induce labour as quickly as possible so as to end the patient's miserable condition,—having made all preparations, especially for p.p. hæmorrhage which I feared most

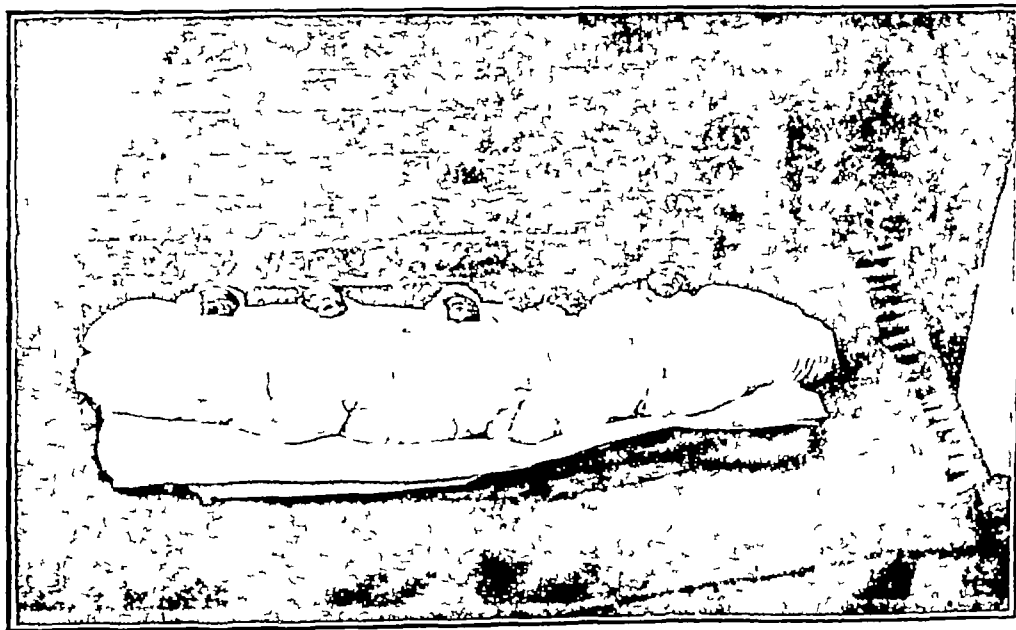
Labour—At 10 a.m. I ruptured the bag of membranes and to my surprise only a normal quantity of liquor amni escaped The

patient had a pain or two, and at 10-30 a m a living baby boy was born and I was surprised to find rather a small child for full term (considering the size of the uterus) There was no difference in the size of the uterus, and rubbing of the uterus was begun at once I waited half an hour, examined per vaginam and found another foetus and bag of membranes intact, which I ruptured, and again only a normal quantity of fluid escaped In a few minutes the patient had a pain or two, when the second baby boy was born alive, a little bigger than the first one Both cried vigorously Rubbing of the uterus was continued There was still very slight change in the size of the uterus, and whilst I took a turn at rubbing the uterus foetal limbs were felt After waiting another half an hour to give the uterus rest, I examined and found a third foetus and bag of membranes presenting, which I ruptured A normal quantity of liquor amni escaped, and in a quarter of an hour or so with one or two pains, the third foetus was born The uterus still remained somewhat big and thinking that only the three placenta remained behind, I waited for another half hour, and very vigorously rubbed the uterus The patient had a pain or two, but from the three cords lying outside the vagina I could see that the placenta were not detached I gave a hypodermic injection of

pain or two came, but I could see that the placenta were not detached I waited a few more minutes and examined again as the limbs of another foetus had been felt whilst rubbing the uterus, but it was some time before I detected another foetus and bag of membranes, which I ruptured, when a pain brought the fifth baby boy, the biggest in size

Another hypodermic injection of infundin, 1 cc, was given Also Liq ext ergot, one drachm, in water by the mouth, as from the size of the uterus I was sure that there were no more foetuses The uterus was well rubbed Under my hand I felt it contracting well I waited three quarters of an hour and by expression and rubbing the placenta were detached When the edges were felt in the vagina I made very very gentle traction on them and then left it to nature The patient had one pain, when one separate placenta, and three other placenta with their edges joined were expelled, the fifth remaining behind In another few minutes it came away after a pain

There was no p p hæmorrhage, the uterus felt like a hard ball, well contracted The patient was washed, etc, given a hot drink and left to rest She stood the whole labour very well, but the third stage tired her out a good deal All the babies came between 10-30 a m and 3-30 p m and cried vigorously after birth



infundin, 1 cc, and again rubbed the uterus well, and whilst I was rubbing, again I felt the limbs of a foetus, and on examination found a fourth foetus and bag of membranes presenting, which I ruptured A normal quantity of liquor amni escaped and in a few minutes the patient had a pain or two, and the fourth baby boy was born There was now an appreciable difference in the size of the uterus, and thinking that I had now really finished I waited another half hour and rubbed the uterus A

Position of the Foetuses

- | | |
|-----------|---|
| 1st & 2nd | One on top of the other, on the left side of the mother, both head presentation |
| 3rd & 4th | One on top of the other on the right side of the mother, both feet presentation |
| 5th | Lying across the fundus, had most room, hence the biggest in size Breech presentation |

Weight.	Length	Survival
1, 3 pounds	14 to 14 inches	34 to 36 hours
2, 3½ "	14½ inches	36 hours
3, 3½ "	14½ "	61 "
4, 3½ "	15 "	36 "
5, 4 "	15 "	29 "

After-treatment Nothing special The patient made practically an uninterrupted recovery and was discharged on the 5th December 1922 in good health

I regret that no measurement of the abdomen was taken before delivery

A CASE OF ENCEPHALITIS LETHARGICA WITH PARKINSONIAN SYNDROME

By J. C. DE,

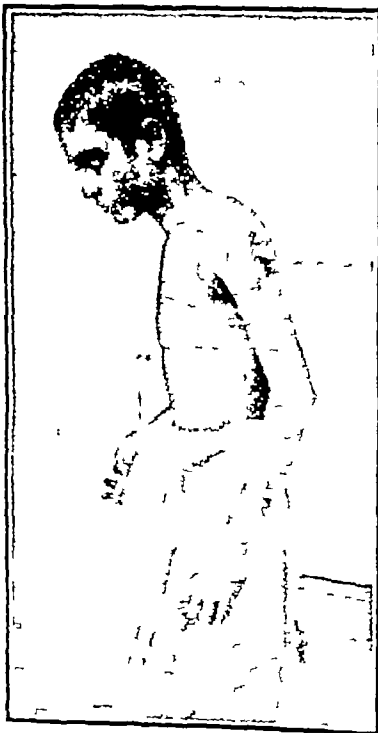
CAPT, I M S,

Medical College, Calcutta

The patient named Bhalai, a Hindu male, aged 15 years, was admitted to the Medical College Hospital on the 24th of April 1922, with the following complaints —

(1) Stiffness and weakness of all the muscles of the body, especially those of the upper half

(2) Indistinctness of articulation



(3) Trembling of the hands and legs on exertion

(4) Lameness of the left leg

Duration little over one year

History—The first sign of any abnormality was detected by his father about 13 months ago, who noticed that the patient was talking rather indistinctly. Five months later whilst attempting to stand up at school the whole of

his body suddenly felt weak and he collapsed in a heap. The feeling passed off quickly and he was able to stand almost the very next minute. The same night he had high fever which lasted for six days. During the continuance of this fever he did not suffer from any marked headache or pains, nor did he lose consciousness at any time. After the fever had left him he found that he was suffering from stiffness and weakness of the muscles of his body coupled with tremors of the hands and legs.

History of previous illness—No illness of any special importance and no history of any fits. The patient was admitted into this hospital about seven months ago for the same complaints as now, with the exception of the following differences—(1) His general health was poorer. (2) The rigidity and weakness of the muscles were, if anything, more marked.

Family History—Father living, aged 50, healthy, mother died of cholera eleven years ago. He has three sisters and one brother, all well.

Condition on admission—Sparely built, fairly nourished, of medium height, expression vacant, resembling the Parkinsonian mask.



Attitude in bed—Lies rigidly, often with the knees not touching the bed, and the right arm, forearm and hand held upright in an abnormal manner.

Method of sitting up—Sits up slowly and rigidly, often with the aid of the hands.

Attitude on standing—Attitude on standing closely resembles that of paralysis agitans. The head is bent forward, the back bowed, the

elbows flexed, the fingers flexed and in the position assumed when the hand is at rest. The eyes are fixed on the ground several feet away, staring.

Walking—Walks slowly, bending forward a little without any associated swinging movements of the upper extremities. There is no festination or reeling about the gait.

Running—Runs fairly well with the body bent and the upper limbs held rigidly.

Muscular power—Right hand grip weaker than normal for a boy of his age and build, left hand very weak. Forearms and arms as in the case of the hands. Lower extremities—no lack of power, fairly strong, and not much difference between the two sides.

Movements—All movements of the body are slowly and rigidly carried out, especially those involving the use of massive muscle groups such as in turning in bed, sitting up, etc. Movements of the limbs or isolated actions are carried out with greater ease.

Fingers—All movements are slow. There are fine tremors whilst writing or drawing a line, etc.

On opening the hands, the fingers slowly unfold and extend, without the spreading of the fingers and abduction of the thumb which take place normally.

Neck—All movements are stiff and marked by a resistance towards passive movements.

Face—Is smooth and expressionless, simulating the appearance of a mask.

Eyelids—The acts of closure and opening are slowly and rigidly performed and marked by fine tremors. Frequency of winking is about normal.

Eyeballs—Movements are carried out in all directions by a series of jerky motions simulating nystagmus, but no true nystagmus is present.

Rigidity—Is mainly confined to the muscles of the upper half of the body. The lower extremities are little affected. The affected muscles are in a state of continuous hyper-tonus not increased by the movement that tests it and not accompanied by contractures, fixation or shortening, thus differing from the rigidity seen in lesions of the motor cortex and the pyramidal tract.

Cataleptoid tendency—A cataleptoid tendency is evinced in the upper extremities. The patient is able to keep the upper limbs raised in a state of fixity much longer than a normal person can.

Dysmetria and Asynergia—Are absent.

Tremors—These are absent at rest and are brought out on bringing the muscles into action (see ante). Fine tremors are noticeable in the fingers, eyelids, etc. They are regular, rhythmical and oscillatory in character, varying from 2—4 vibrations per second. They can be partly controlled by an effort of the will. Pill rolling movements are absent. A

generalised shaking of the whole body takes place on performing any act requiring the use of the bulk of the muscles of the body, if prolonged for more than a couple of minutes.

Co-ordination—Normal. Romberg's sign absent.

Nutrition of the muscles—Fair. There is no wasting of any muscles. Electrical reactions of the muscles of the extremities normal.

Reflexes—Nearly all reflexes, superficial and deep, are brisker than normal.

The plantar reflex is indefinite and is never typically extensor in character.

Organic reflexes and sphincters normal.

Sensory function—All sensory functions normal.

Cranial nerve functions—*Optic, Oculomotor, Trochlear and Abducens* normal—*Vision*—Refraction

R E D V $\frac{3}{8}$ 5 D cyl axis vertical = $\frac{1}{2}$
L E " $\frac{1}{6}$ 5 " " " = $\frac{1}{2}$

Field of vision—In the left eye shows concentric diminution on all sides, excepting below. In the right eye marked diminution in the field above and towards the temporal side.

Pupils—Are equal in size and appearance, light reflex present but slow.

Accommodation reflex normal. *Disc and fundus*—R E pale but fairly normal. L E Disc distinctly atrophic especially in the papulo-macular area. Fundus generally pale.

Trigeminal—The act of mastication is normal, but a difficulty in relaxing at times the bite of the teeth during mastication is complained of.

Facial—Excepting the changes already noted there are no other changes. There are no signs of any actual paralysis.

Hypoglossal—The tongue appears small and narrow. Its movements, especially that of protrusion, are marked by a slight rigidity. Other movements normal.

Other cranial nerve functions—First, fourth, eighth, ninth, tenth and eleventh normal.

Intellectual functions—Intelligence not impaired, memory for events, recent and old, good. Temperament—placid, not nervous or subject to emotional disturbances.

Speech—Is slurred with a tendency to quickness. There is no globus and scanning in connection with his speech.

Writing—Fair, showing signs of fine tremors.

All other systems—Normal.

Blood serum—Negative to Wassermann test.

Cerebro-spinal fluid—Quite clear. Only a few lymphocytes found. W R negative absolutely. Globulin—practically nil. Effect of stay and treatment in hospital (10 weeks)—no change. The damage appears to be permanent in character and there are no appreciable signs that it is progressive.

The case presents features in common with certain diseases to which it bears a resemblance to a greater or lesser degree. These diseases are disseminated sclerosis, hysteria, Parkinson's disease, progressive lenticular degeneration of Wilson, postural hypertonus of palladian origin and the Parkinson syndrome following encephalitis lethargica.

To *disseminated sclerosis* it presents fairly close resemblances in (1) the age, (2) intentional tremors, (3) the nystagmoid movements of the eye balls, (4) the optic atrophy in the left eye with concentric diminution in the field of vision in that eye and irregular diminution in the right, and general pallor of the fundi, (5) the general exaggeration of the deep reflexes. The differences are however sufficiently numerous and fundamental to reasonably exclude this disease.

The negative differences are —(1) The remarkable constancy of the symptoms with no tendency to variability and abatement (2) Limitation of disabilities mainly to the upper half of the body (3) Absence of characteristic speech, tremor, nystagmus, diplopia, incoordination of the arms, extensor response of the plantar reflexes, and impairment of sphincter control (4) Exaggeration of the superficial reflexes (5) Very slight affection of the legs (6) Mental stability.

Hysteria—Is suggested by the presence of a syndrome characteristic of an atypical nerve disease, the presence of a cataleptoid tendency in the upper limbs and fair general health, but the mental stability, the constancy of the signs and symptoms and the absence of stigmata exclude the presence of this disease.

Parkinson's disease—In its paralytic disturbance and characteristic rigidity the affection closely resembles this disease. In fact it might aptly be called Parkinson's disease of a juvenile type. The points of differences from the classical disease are (1) Age of the patient (2) Absence of characteristic tremors (3) Festination (4) Absence of vasomotor disturbance, restlessness and any appreciable signs of progress.

Progressive Lenticular Degeneration—Resembles this disease so far as age, hypertonicity of the muscles, paresis, dysarthria and tremors are concerned but differs in the absence of (1) a familial history, (2) contractures, (3) emaciation, (4) emotionalism and mental disturbance, (5) progress.

Postural hypertonus of palladian type—J Ramsay Hunt has developed the theory that the rigidity of paralysis agitans is a postural hypertonicity resulting from paralysis of the palladian system of the strio-spinal pathway. His conclusions are based upon careful pathological examination of three cases of paralysis agitans.

He noted striking pathological changes in the large motor cells of the caudate nucleus and putamen in the form of a chronic cellular atrophy. Bearing in mind the close resemblance between the symptoms of the present affection and paralysis agitans it would not be unreasonable to suppose that the pathology of both is identical, i.e., atrophy of the large motor cells of the corpus striatum.

The cardinal features of the affection under consideration are characteristic paralytic disturbance, rigidity and tremors. The paralytic disturbance is more of the nature of a paresis, confined to the upper half of the body, and coupled with the loss of associated movements of the upper extremities on walking, etc.

Rigidity forms a conspicuous feature of the disease and one which contributes very materially to the general disability. It is combined with a degree of spasticity, as is evidenced by the resistance felt in passively moving the upper extremities and the neck, a spastic rigid state probably due to some involvement of the pyramidal system. The paresis, the spastic rigid state, plus the exaggeration of the reflexes point to a upper motor type of lesion, but of a different nature from the cortico spinal or pyramidal type of lesion, as is evinced by the absence of contractures, fixation and athetoid movements. The affection is therefore thought to be due to disease of the strio-spinal system (extrapyramidal lesion) of a nature and type corresponding to the findings of Ramsay Hunt in paralysis agitans.

Parkinson syndrome in Lethargic Encephalitis—As regards etiology it has been suggested, and it seems very likely, that the affection is in fact a Parkinsonian syndrome following an unrecognised attack of encephalitis lethargica, in support of which there exists the very definite history of an attack of acute fever followed closely by the onset of rigidity, paresis and tremors.

Nixon reports the case of a boy who as far back as the year 1908 presented unmistakable symptoms of what is now recognised as lethargic encephalitis, which terminated in the "paralysis agitans syndrome." The case was under observation in the Bristol Royal Infirmary and as he slowly recovered it was noticed that he held his hands and fingers in a position suggesting the carpal spasm of tetany. This was not present in the feet. He also developed a constant tremor in the head and hands, much increased on voluntary movement. Eventually the boy left the infirmary in a condition of well marked "paralysis agitans."

Mary and Levy describe the following points of differences between the Parkinsonian syndrome in lethargic encephalitis and typical paralysis agitans.

In the Parkinsonian syndrome (1) The age is between 20—40, but it may occur even in childhood (2) There pre-exists a general disease usually febrile in character (3) The onset is abrupt and *en masse* at the same time (4) Tremors of the hands, typical of paralysis agitans are absent (5) There exists difficulty in protruding the tongue and tremors in the tongue when protruded (only partially present in the present case) (6) Mastication is carried out in an abnormal manner almost exclusively with the incisors, to the exclusion of the molars (absent in the present case)

From the above description it would be seen that the case under consideration resembles even more closely the Parkinsonian syndrome in lethargic encephalitis than it resembles typical paralysis agitans, and this plus the very definite history of acute fever at the onset of the disease would seem to indicate an origin from an identical cause, *i.e.*, an unrecognised attack of encephalitis lethargica

In conclusion I wish to express my indebtedness to Lieutenant-Colonels F A F Barnado, W V Coppinger, *IMS*, and Major J A Shorten, *IMS*, for valuable suggestion and help received in writing this paper

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A CASE OF OEDEMA OF THE LEG FOLLOWING PLAGUE

By Dr GOPAL SINGH CHAWLA, *MB, BS*, Lahore

A Sikh named Kishan Singh, aged thirty-five years, of the Gurdaspur district in the Punjab, consulted me on the 11th June 1922, with the following history—Six years previously he suffered from bubonic plague, the bubo appearing in the right groin. The bubo having supplicated it was incised and the pus evacuated. The incision healed in due course, leaving a thick scar. Some five months after this his right leg began to swell. The swelling disappears when he rests it and reappears when he walks about. There is no pain in the leg. The swelling has never gone above the level of the knee joint. He had massaged the leg with different remedies advised by hakims but it had given him no relief.

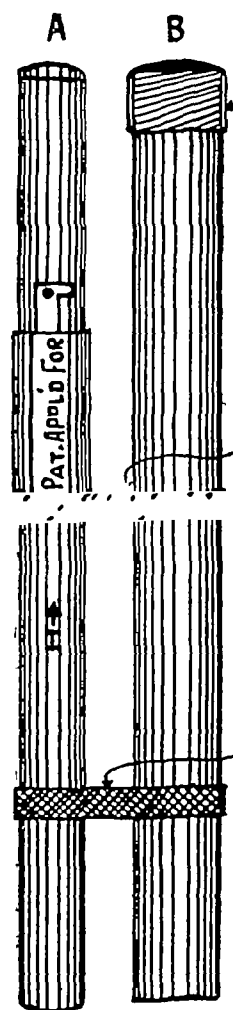
Physical Examination—The right leg is about three times the size of the left (healthy) leg, there is no difference in colour on the two sides, the swollen leg pits on pressure. The inguinal glands are not enlarged. The swelling involves the right foot also, and extends only up to the right knee joint. Examination of the heart shows nothing abnormal. No other defect in any other organ of the body.

Treatment—Tinct digitalis in 7 minim doses was prescribed. The patient was advised to try treatment for fifteen days but as he could not stay he had to go back. No examination of the blood was considered necessary as the patient had never gone out of the province and there was nothing to indicate elephantiasis. I have not been able to find any record of similar cases in the literature at my disposal.

AN ASEPTIC THERMOMETER CASE

By SENR. SUB-ASST SURGEON, LACHMANDAS,
Civil Hospital, Loralai, Baluchistan

Medical practitioners are accustomed to take their patients' temperatures in the mouth after a preliminary cleansing of the thermometer merely with plain water a procedure which is not free from the risk of carrying infections. Accordingly I venture to suggest the use of the thermometer case illustrated in the sketch where, in addition to the ordinary thermometer case, there is a



second case B, closed with an air-tight screw cap, which might be filled with alcohol, or other disinfectant. The thermometer having been taken out of its case should be dipped into the disinfectant in case B before use. Such an article would be larger than the ordinary thermometer case to carry, but would ensure that the oral use of the thermometer would be free from its present risks and dangers.

Indian Medical Gazette

MARCH

OPHTHALMOLOGY IN EGYPT AND ITS POSSIBILITIES IN INDIA

MR A F McCALLAN, F.R.C.S., the Director of the Egyptian Government Ophthalmic Hospital has good reason to be proud of the record of his department. The origin of the modern service of ophthalmology in Egypt dates from 1903 when the late Sir Earnest Cassel created a trust fund of £41,000 for the purpose of teaching ophthalmology to qualified Egyptian medical men. Mr McCallan was invited to organise and direct the movement. He started with one travelling hospital in tents and one Egyptian medical officer, but a few years later the Egyptian Government took over the organisation and agreed to maintain a permanent hospital in each of the 14 provinces of Egypt on the understanding that each hospital should be built and equipped from local funds. A sum of £100,000 has been raised since then and no less than twenty special hospitals are in existence under the direction of Mr McCallan. The advantages of the system are that it is possible to do an enormous amount of clinical work and to test new methods of treatment on a large scale in a very short time. There is now also a special clinical laboratory in Cairo where teaching and research work can be carried on in association with the large hospital of Giza.

Important additional work is carried out in the form of organised ophthalmic inspection and treatment in the Government primary schools. It would seem to be worth while for the Government of India to examine the working of this splendid organisation, for in spite of the fact that workers in India have always been in the front in advances in ophthalmology there has been little organised work in ophthalmic research except in Madras, even there the work has been done by men who have already a large amount of routine duty to perform. India on the whole owes its position in the ophthalmic world entirely to the energies of individual enthusiasts whose names are so well known that it is not necessary to mention them. What has been possible in Egypt should also be possible in India, and it would

appear that the first step should be the establishment of schools of ophthalmology in places like Madras and Calcutta where ample facilities exist. At these schools advanced teaching and research in ophthalmology would be carried out, and the next step would be to organise a system of ophthalmic relief at selected centres all over India. In Calcutta there is a magnificent new Ophthalmic Hospital which is admirably fitted for such research and teaching work. This hospital was built as a result of the persistent efforts of the late Lt-Col Maynard who unfortunately has not lived to see the fruits of his labours, and the present financial embarrassment of the Bengal Government appears to be an insuperable obstacle to the proper utilisation of an institution which has unlimited possibilities.

The hospital is next door to the Calcutta School of Tropical Medicine whose bacteriological experts would be at hand to help in carrying out systematic scientific research, and it will obviously be a loss to India if the opportunities for a work of such national importance should be wasted.

Even if financial stringency be a reason for avoiding any ambitious enterprise it is certain that the foundation of a national research institute for work on ophthalmology should be undertaken without delay. The building and the equipment are ready to hand, there is an unlimited wealth of clinical material and it is only the staff that is needed.

This need not be expensive, there must be men already in the service of Government who could be deputed to carry on the work. The employment of a small staff would lead to a great increase in the efficiency of ophthalmic surgeons throughout India and to great advances in our knowledge of the eye diseases of the country. It is clear that the men who would be engaged on this work would be employed to better purpose than in the routine work on which they are now engaged. It is certain that the local ophthalmic surgeons, of whom there are many in Calcutta, would take their share in the work, but the first essential is a small but highly trained whole-time staff which would devote its entire energies to the work of teaching and research.

The work done at Madras is beyond praise, but there is great need for an imperial institute at a centre which is suitably situated for

supplying the needs of post-graduate students from the whole of India. A conference of the ophthalmologists of India would doubtless evolve a scheme which could be put into operation without delay, and at a cost which would be trivial in view of the vastness of the results which will be certain to follow on the adoption of a well organised scheme.

It is true that in India diseases of the eye are not so urgent a problem as they are in Egypt, but ophthalmic surgeons will testify to their importance as causes of suffering and disability, whilst the existing facilities for training and research work are ridiculously insufficient to the needs of the country. It is not a question of India being unable to afford a School of Ophthalmology, the real position is that India can ill afford to do without such a school.

INSULIN AND DIABETES IN INDIA

IN another column will be found a report of some remarks recently made by Sir Charles Sherrington on the subject of insulin. These will be read with great interest owing to the importance of diabetes in this country. It is well at the outset to say a word of warning to those who may think that insulin is likely to be a solution of the problem of diabetes in India. Diabetes in so far as its causation and course are concerned is not one disease but two or more, and the most common form of diabetes in India appears to be a result of years of wrong living. It is probable that by the time the disease comes under the care of the medical man, those organs of the body which are concerned with carbohydrate metabolism are already so seriously damaged that a real cure is out of the question.

Treatment, however, may do much to keep the victim in comparative health, and whilst it is possible that insulin will be a valuable aid to the physician, no one will be satisfied merely with a palliative, we must aim at *prevention* of the disease.

Diabetes is something of a nightmare to the well-to-do and leisured classes of India, and there are thousands of people who are looking forward with well founded apprehension to the day when sugar will be found in their urine. In many cases the earlier symptoms are deliberately ignored because the victim

fears to admit, even to himself, that he is in the grip of the disease. Even if the disease is recognised at a stage which is usually regarded as early, the patient is probably several years too late in taking action. It is only in the pre-glycosuric stage that the disease can be cured in the sense of leaving the patient a first class life. There is no advantage in encouraging false hopes of a radical cure either by systems of diet or by some of the much advertised nostrums. It is ridiculous to suppose that any drug will cure diabetes. If there were such a drug it would be worth crores of rupees to the person who had the good fortune to know of it, and nothing can be more pathetic than to see a down-at-heels quack who claims to be in possession of an infallible remedy for diabetes. If his claim were justified he would be like a man who is living in poverty in spite of having the finest diamond in the world in his waistcoat pocket. There is a great amount of evidence that the common form of diabetes in India results partly from a diet containing too much carbohydrate and partly from a lack of exercise. The appearance of sugar in the urine means that the long suffering carbohydrate mechanism has at last failed in its effort to deal with the overstrain to which it has been subjected, and that the organs concerned have suffered a greater or less degree of damage. In the earlier stages it is still possible to promise the patient many years of life in comparative health provided that he agrees to submit to a rigid regime, but too often he refuses to change his habits. His rice and other carbohydrates are to him what opium is to the opium eater, and every practising physician will testify to the difficulty which he experiences in persuading the diabetic to stick to a suitable diet.

Sooner or later the patient begins to tire of dieting and starts on the search for a drug which will cure his disease. In this vain pursuit he is encouraged by a whole army of quacks whose livelihood depends on humouring the weaknesses of humanity.

The first thing to be made clear is that diabetes is not an inevitable visitation, in most cases the victim has earned his disease just as thoroughly as the meat eater and wine drinker of England has earned his gout. In both cases the disease is the result of years of dietetic unrighteousness and it is interesting to learn

that with the change in the habits of the Englishman of modern times gout is a rapidly disappearing disease. Scientific research on diabetes in India should be directed towards discovering the factors concerned in the great prevalence of the disease and in putting these on a definite basis. Most medical men in India recognise that diabetes usually results from wrong habits of living, but the majority of patients refuse to accept this uncomfortable doctrine and adopt instead the fatalistic outlook and so escape the distasteful change in their diet and habits which would be necessitated by acceptance of the rational view of the disease.

It is likely that the production of overwhelming evidence as to the cause of the disease and wide publication of the facts may arouse the public to an appreciation of the true state of affairs, and we may see the disappearance of a disease which has aptly been described as "the gout of Bengal."

RELAPSING FEVER IN PANAMA

DARLING in the *Journal of the American Medical Association* for September 27th, 1922, discusses the rat as a possible reservoir of relapsing fever. He found that the tick *Ornithodoros talajac* which transmits the spirochæte of the disease in Panama, infests rats. These rats are known to be susceptible to infection with *Spirochæta novyi* and he thinks that it is quite possible that the rats play a part in the dispersal of the ticks and also of the infective agent of the disease.

Darling cites the example of plague as an instance of the part played by the rat in conjunction with an insect in the dissemination of a disease and suggests that something similar may happen in the case of relapsing fever. The lower animals are susceptible to many human infections and it is possible that their rôle as reservoirs of human disease is of greater importance than has hitherto been suspected. Some of the unexplained problems of epidemiology may have their solution in the finding of animal reservoirs of infections which have hitherto been regarded as being confined to human beings.

NOTICE TO CONTRIBUTORS

THE Editor of the *Indian Medical Gazette* begs that contributors will note the following points —

1 Brevity is the soul, not only of wit, but also of journalism. The *I M G* at present receives monthly more than twice as much material as can be published, and many articles which would otherwise be immediately accepted for publication, are often unavoidably held up for months, owing to want of space.

2 Manuscripts should be sent in in their final form ready for printing. They should be typewritten for preference (although clearly written MSS will be accepted), and should have a wide margin and double spacing between lines, in order to allow of corrections.

3 Tables, charts, etc., should be typewritten on separate sheets from the rest of the manuscript, and should be referred to, not as "the following" or "the above" table, but as Table 1, 2, 3, etc. Tables are usually reproduced in smaller sized type and are separately set up.

4 The number of illustrations should be reduced to a minimum. Some articles are often held up for months on this account whereas if less profusely illustrated, they would be immediately accepted. Coloured illustrations will be accepted, under present conditions of high cost of production and labour, only under very exceptional circumstances. Illustrations should be either photographic or in clear black and white. Charts etc., should be in black and white with continuous, dotted, broken, etc., lines and not in colours. Indian ink on white Bristol board is best for line blocks. No washes, tinting or pencil shading should be used.

5 Illustrations should not exceed $10\frac{1}{2}$ by $7\frac{1}{2}$ inches or if larger should be an exact duplicate of these dimensions, e.g., 21 by 15 inches. For photographs good chocolate brown P O P paper prints are best.

6 Contributors will materially assist the editors if they express their readiness, in the event of it being impossible to publish their contributions in full, to agree to publication of abstracts, resums, or summaries of their contributions in "Current Topics," "Mirror of Hospital Practice," etc.

7 Correspondents are asked to note the exigencies of publication. Thus the "January 1923" number of the *I M G* had to go to press on Dec the 4th, 1922, and the illustrations for it on Nov 20th, 1922, in order to allow of time for printing and correction of proofs.

Address.

MEDICAL RESEARCH, ITS AIMS AND ECONOMIC VALUE

By HUGH W ACTON,

MAJOR, I M S,

Professor of Pathology, School of Tropical Medicine and Hygiene, Calcutta

Being the Presidential address at the Medical Research Section of the Indian Science Congress, January, 1923

IN India a new spirit has arisen amongst her peoples and claims are made with regard to their ability to occupy positions in every branch of science. The reason that is advanced is that the people are not given opportunities to enable them to become research workers. Most original scientific work in history was not state aided—Who helped Pasteur in his early days when he was studying the rotation of tartaric acid, or Harvey or Jenner or Lister? These were all individual and unaided efforts. Again the word "research" has a definite meaning. It does not mean the publication of numerous papers that do not advance our science one iota further in knowledge. The word is also seen in a debased form when applied to commercial laboratories whose main idea of research is to find fees for the proprietors' pockets. Now there are two kinds of research workers—

Original—Such individuals see to the limit, or even further than their facts warrant them to go, and outline the plan of the structure. Take Pasteur as an illustration. Every housewife knows that soup goes bad when kept, and the common belief was that access of air caused it to go bad. Pasteur after many experiments, was able to prove conclusively that air had nothing to do with it, provided the organisms in the air were prevented from access to the broth. This simple observation laid the foundations of our modern science of bacteriology. The gift of originality has no relationship to seniority, caste or creed, and is an inborn gift with which the individual is endowed. See how cosmopolitan are our great men, Harvey, Jenner, Lewenhock, Pasteur and Ehrlich. Such a type of man will give the necessary stimulus to any institute. The other class are ourselves.

The Detail Workers—Such individuals are easy to obtain. Here it is the Germans and Japanese, who are so good in filling in the details of a bigger plan. The Germans have the three traits so necessary for this type of research, unbounded capacity for work, infinite patience, and self sacrifice. The Japanese lack in personal disinterestedness. The Indian worker is excellent when he is zealous and willing to sacrifice the lure of private practice. The Indian Government realises the value of self sacrifice in research work as it only grants two-thirds of one's pay during deputation abroad. The want of zeal in Indian workers is supposed to be the fault of the climate, but I am inclined to the belief that the main cause is due to family ties. Our students marry young and start with a family before being qualified, and have to start thinking how to earn money for the family. Their main object is therefore to get through examinations largely by memorising and often without properly understanding the subject. One must have a knowledge of chemistry, microscopic and macroscopic anatomy, and physiology before one can appreciate how disease alters the structures and functions of tissues, and before one can understand the action of drugs. One's knowledge should be made as wide as possible by reading collateral sciences. Personally I got great help from astronomy, by reading how star distances were measured. This method gave me the idea of associating dose with death time, and resulted in the work on snake venoms that Knowles and I did at Kasauli. Again Einstein's theory of relativity gave me the clue as to why quinine is ten times more powerful when acting in a pH of 8, as in a pH of 7. The reason is that in an

alkaline substrate the basic molecules of quinine are not affected in any way, so that when living tissue such as a *Paramoecium* comes into the field with a different pH, say somewhere about pH 7, every basic molecule of quinine in its vicinity tends to gravitate on to its cell membrane, and so this alkaloid appears to us to be ten times stronger in its action in alkaline sub-states.

Before leaving the subject of medical research workers I may point out the two great lessons I learnt whilst working under Dr Dale at Hampstead, viz—(a) *Firstly* The limitations of one's knowledge. Nowadays the number of subjects that overlap in medical research is too extensive for any one man to master chemistry, physics, zoology, and its branches, entomology and helminthology, besides a working knowledge of biometrics and statistical methods are all required. All should recognise this fact, not only the workers but also the administrators. Further general and universal medical problems such as tuberculosis, osteo-arthritis etc., are far better worked out in Europe, where there are able men, with better scope for material and working in well-equipped laboratories. Our great problems are the diseases peculiar to the tropics, and here our material and scope at Calcutta are far better than that at any other School of Tropical Medicine. For purposes of convenience I have divided the problems as follows—

The seven great scourges that affect all India—viz, malaria, ancylostomiasis, dysentery, plague, cholera, leprosy and the enteric group.

The seven lesser scourges of Provincial importance—viz, kala-azar, filariasis, guinea-worm, relapsing fever, the dengue group of fevers, Naga sore, and oriental sore.

Besides these diseases, we have a very important group of dietetic diseases. Some hold the view that they are deficiency diseases. Others like myself, that some poison is generated in the food. They are beri-beri, epidemic dropsy, glaucoma and keratomalacia or the famine food diseases such as lathyrism and Kodon poisoning.

Secondly The value of co-operation. Look at the position to-day. There are bits of work going on all over India, and one worker does not know what the others are doing, so there must necessarily be a large amount of overlapping. Work on kala-azar is going on at two centres in Calcutta and at Shillong, Coonoor and Bombay. At the School of Tropical Medicine we are tackling the problem systematically, we have worked out when infections are most likely to occur, so as to obtain the best material for the study of transmission. The entomologist will work at the insect carriers, the protozoologist at the life cycle of the parasite, the clinician at testing the effects of the various antimony compounds, whilst the pharmacologist will test the effects of these remedies on living tissues.

The object of research is to obtain—

Truth or Knowledge—Truth consists of simple disinterested knowledge, deduced from the facts obtained by experiments or clinical tests, etc. Failure to obtain this knowledge is usually due to personal bias, when facts are made to fit in with one's preconceived theory, to reasoning by analogy, a dangerous type of argument which is so commonly employed in medical literature, where two totally different phenomena are compared as similar to suit the argument, and lastly to the vice of authority. It is very difficult to make the medical profession give up old, cherished and time-worn beliefs. Another fruitful source of errors is that due to statistics. Here failure to note the composition of one's population, partial and spurious correlations, and that dangerous habit of making percentages out of a few observations are the mistakes chiefly made.

The aims of research—As the principle object in medical research is to attain a complete knowledge of these diseases, our aim should be directed to—

(1) *Prevention*—This should be our main and ideal objective so that by diminishing disease we will decrease the mortality and the necessity for treatment. In this way more good will accrue in financing research and sanitation than by endowing elaborate and expensive hospitals. In tropical disease we fortunately know most of the methods by which these diseases are spread from man to man. In the protozoal diseases we owe a great

debt to Sir Patrick Manson for his discovery of the method of filarial infection, which opened up the fact that biting insects were capable of transmitting disease from one human being to another. This work was soon followed up by Ross' discovery of the malarial cycle in the mosquito, and still, later by Major Mackie's work on the transmission of relapsing fever by the body louse. In bacterial diseases we have the work of Lieutenant-Colonel E. D. W. Greig on the carrier problem in the enteric fevers bacillary dysentery and cholera, and now Sir Leonard Roger's and Dr Muir's work on the mode of transmission of leprosy. Other names are not so well known such as Lieutenant-Colonel Glen-Liston's discovery of the transmission of plague by the rat flea, for which he has never got due credit, as this important discovery was submerged in the *Plague Commission's* Reports, MacWatters and Hepper's work in 1903-1909 on typhus in Peshawar jail, showing that it was an insect borne disease lies buried in the *Indian Medical Gazette*. There is only one important tropical disease that wants to be immediately worked out and that is kala-azar. Here for a number of years thousands of bed bugs have been torn into shreds with no definite results, and it would be better to divert attention to other house insects such as the flea and the sandfly. Although general lines have been found in these transmission cycles still a good deal requires to be discovered as regards the relationship of temperature humidity, etc., which play so important a part outside the body of the host. We have two papers illustrating this point, one by Dr McVail suggesting that the female hookworm lays more eggs during the monsoon months, when the chances of infection are most suitable from every point of view, and another by Mhasakar and Kendrick who point out that mass treatment is best carried out against the hookworm before the rains. A very interesting chart is being shown by Major Russell illustrating the close relationship between cholera and the wet bulb temperature in the three Madras Presidency sub-divisions.

Prevention in tropical diseases is now passing out of the hands of research into the sphere of practical sanitation. Look at what Sir Ronald Ross did for Ismailia and Port Swettenham whilst his work allowed the practical sanitarian Colonel Gorgas to make it possible for human labour to construct the Panama Canal. We may ask ourselves, why cannot we do this in India? Because sanitation is ruled by—

(i) The economic conditions of the country, and the finance budgets of the different provinces can only supply a limited amount of money.

(ii) The people will often not co-operate for their own good, so that the only thing that can be done is to employ legislative measures.

I have placed the Sanitary Department last, as measures against prevention of disease are cramped by lack of money, and the indifference of the people to break away from time honoured customs.

We sometimes see money wasted in useless measures, but such occurrences are largely due to ignorance, and not to want of accurate knowledge. Who has not seen money wasted in constructing a pucca drain, because it was unsightly and supposed to breed malaria, whereas any self-respecting malarial transmitting mosquito would never deign to breed in such a place? One aspect of prevention has hitherto been neglected, the possibility of poisonous substances being present in the food eaten by our people. I believe that such diseases as asthma glycosuria, etc., may have a possible explanation in the fact. I am glad to see in the list of papers two by Drs Howard Simonsen and Captain Anderson suggesting that lathyrism is not due to *khesari dal* (*L. sativa*) but to an adulterant weed *Vicia sativa*. The evidence they offer in favour of their view will be interesting to hear. Our aim as I have said should be to get at the truth and thereby prevent many thousands from being paralysed during times of famine in Central India.

(2) Our next aim should be to improve our knowledge of the existence of these diseases. This will prevent us from shutting our eyes to the occurrence of these diseases. We will then realise how common are such

diseases as ancylostomiasis, amebiasis etc., amongst our population. Some years ago I diagnosed several cases of paratyphoid fever in a regiment by bacteriological cultures, and was asked after the returns were submitted how I had diagnosed the cases. In answer to my reply I was informed that paratyphoid fever was almost unknown in the Indian army, and that all bacteriological diagnoses should be made only by the Divisional Laboratory. On the other hand if we become too scientific and insist on bacteriological tests, the incidence of the disease will naturally diminish in the returns.

Take the history of kala-azar in Bengal. At first every case of enlarged spleen was malarial in origin, after the discovery of the parasite of kala-azar more and more cases of kala-azar were diagnosed, and then came the fashion that every enlarged spleen was due to kala-azar and now with more exact tests, spleen puncture, the aldehyde test etc., the incidence is apparently diminishing. The improvements which we can effect in our knowledge are—

(i) More careful survey of the geographical and seasonal incidence of these diseases, so that sanitarians can predict epidemics and warn the general practitioner as to their likelihood of occurrence. Here we have an excellent paper by Major Russell on relapsing fever in Madras giving us its incidence and peculiar relationship to the population of this province.

(ii) Better diagnosis.—This has been improved recently by various tests e.g. McVail's modification of Claxton Lane's method of examining for hookworm ova. This does away with the necessity for a centrifuge and the students in our classes rarely fail to find the ova if they are at all numerous. Namer's aldehyde test, although not a specific test is extremely useful in diagnosing kala-azar cases of some duration. The value of the finding of Charcot Leyden crystals in diagnosing cases of amebic infection of the colon (Acton) although cysts and amebae are absent is another instance. The more elaborate laboratory tests such as the cultivation of *L. donovani* flagellates from the peripheral blood perfecting media etc. you will hear of but they largely concern laboratory workers. An excellent beginning in this way has been started in Madras by Major Cunningham and Russell in establishing a bacteriological unit which can be sent off at a moment's notice to investigate any epidemic. The work of this unit has given us three papers, two on relapsing fever and one by Cruickshank on the cholera vibrio.

(iii) Post graduate teaching.—At present in most Indian medical schools the teaching of the diseases peculiar to the tropics is not sufficiently laid stress upon, although these diseases are of vital interest to the population. Students often leave the hospital with a very hazy knowledge regarding the method of transmission and proper treatment of these diseases. A beginning is being made in this direction at the Calcutta School of Tropical Medicine where we have over forty post-graduates in the class and where I can say without hesitation that the material and teaching is better than at any other school of its kind.

A single school cannot teach these diseases to all the members of the medical profession in India, but there are among us officials and non-officials who are experts in their various branches and a "System of Tropical Medicine" could be compiled with a special view to the requirements of India. This is urgently needed and such a cheap and well illustrated book would do more than any school to broad-cast this knowledge amongst our professional brethren.

Discovery of Specific drugs.—India owes a debt of gratitude to its Medical Service for the discovery of many of the specific drugs. Here unfortunately such drugs have suffered numerous vicissitudes at the hands of the medical profession owing to prejudice. Take the case of the use of ipecacuanha in dysentery. For years came the idea that large doses were wanted 20 to 60 grains of the powdered root. Then as such doses could not be tolerated it was recommended that the emetine should be removed, and de-emetised ipecacuanha was

water At any rate there is no evidence that the urine is more hæmolytic than that of healthy persons

Further evidence is adduced by Yorke which is strongly opposed to the view of a destruction of the blood corpuscles in the kidneys rather than in the blood, and the conclusion is reached that the old view is likely to be correct that the destruction takes place in the blood stream

The mechanism of the sudden hæmolysis which occurs in the disease is far from clear The work of Christophers and Iyengar affords evidence against the existence of a toxin or artificial hæmolysin which produces the hæmoglobinuria

Dr Yorke's review is useful in bringing home to us the scantiness of important work of blackwater fever in recent years and the vagueness as to the mechanism of the disease His résumé should be read by all who are interested in the disease.

Notes on Antisepsis.

By ALFRED JOHNSON, M.D.,

New York City American Journal of Surgery,
September 1922, p 209

THE author advocates the consideration of three factors in the selection of an antiseptic for surgical purposes (1) the bactericidal or Rideal-Walker index, (2) The toxicity when carried by the blood stream, (3) The harmful effect on living tissue-cells (which may be approximately estimated by the power of the antiseptic to coagulate serum) If the first factor is high and the second and third factors low, the antiseptic is valuable for surgical purposes

A fourth factor might be added that of power to penetrate the tissues From observation it appears that aqueous solutions penetrate living tissues about equally, the solutions of volatile agents such as chlorine and iodine having a higher power of penetration than the solutions of the more stable chemicals

The power of penetration is greatly enhanced by solution in alcohol Solutions in 50 per cent. alcohol permeate the tissues to at least twice the depth of an aqueous solution Beyond 50 per cent strength alcoholic solutions commence to lose their potency as surgical antiseptics

A brief comparison of two such similar salts as bichloride of mercury and biniodide of mercury illustrates the advantage of the principle of relying on the surgical antiseptic index, rather than upon the empirical use of bactericides in surgery The two salts are nearly equal in their bactericidal effects In round figures, bichloride of mercury coagulates serum in solutions of less than 1 in 8000 a solution of biniodide of mercury to which 4-5 of iodide of potassium is added fails to coagulate serum in 1 in 100 solution This power of coagulating serum results in solutions of bichloride of mercury destroying defensive tissue-cells thus rendering it an indifferent surgical antiseptic Biniodide of mercury is free from these drawbacks, and is in the front rank of effective surgical antiseptics

To secure additional penetration alcohol may be employed It is found that 50 per cent. is the maximum strength in which this may be employed without coagulating serum, and damaging living tissue cells

Congenital Pyloric Stenosis and its treatment by Atropine.

In the number of the *Journal of the American Medical Association* dated October 14th, 1922, Dr Sidney V Haas of New York discusses the treatment of congenital stenosis of the pylorus and as a result of an experience of forty cases of varying degrees of severity, with only two failures he has formed the opinion that the disease is amenable to atropine.

He lays stress on the following points Errors in diet and hygiene must be rectified Saline solution

must be given subcutaneously at frequent intervals until the stomach is capable of absorbing sufficient liquid

The atropine must be freshly prepared, as solutions rapidly deteriorate The dose varies from one thousandth of a grain at each feed or even less and is gradually increased to a maximum which either controls symptoms or produces flushing or other indications of the action of the drug

The largest dose used was sixteen thousandths of a grain at each feed or one-eighth of a grain in the 24 hours The treatment may have to be kept up for long periods, even for the greater part of the first year of the infant's life If constipation with rectal tenesmus occurs the omission of a few doses of the drug will be called for

Two cases of Syphilis of the Liver with symptoms of Abscess formation

By WALTER K. HUNTER, M.D., D.Sc.,

Professor of Medicine, University of Glasgow Glasgow Medical Journal, October, 1922, p 225

THE cases recorded in this abstract are of special interest as such manifestations of syphilis are by no means uncommon in India and they give rise to frequent mistakes in diagnosis

It is commonly recognised that syphilis of the liver may show itself with fever and rigors suggestive of hepatic suppuration Such cases have been mistaken for liver abscess, for malaria, or for typhoid fever

The first case was admitted complaining of vomiting, jaundice, and "ague" of several weeks' duration The vomiting first appeared about two months prior to admission, and lasted for eight to ten hours Three weeks later the vomiting recurred, and had been present nearly every day for four to five weeks up till the time of admission to hospital The vomitus was green or yellow in colour With this return of the vomiting, jaundice appeared and gradually became more intense

Shortly after the onset of jaundice the patient began to have paroxysms of shivering with fever, and followed by profuse sweating To begin with he would have two to three attacks in the day, and never less than one attack *per diem*, but the attacks came irregularly, and lasted from one to two hours at a time He had been a soldier in India for six years, where he contracted malaria He had had four or five attacks of malaria since then, but none for the past five years

On admission the patient was seen to be a spare man, but not emaciated Jaundice was well marked There was considerable tenderness in the right iliac region, but no rigidity, and no induration was to be made out Neither liver nor spleen was palpable

For the first five weeks after admission the temperature was of the intermitting type with a daily range at times from 97 degrees to 105 degrees F During this time there were 27 rigors in all, sometimes with half an hour and sometimes with several days between the paroxysms

Examination of the blood films on five different occasions failed to show any sign of the plasmodium, and the leucocyte count, which ranged from 9,000 to 11,500 showed only 8 per cent mononuclear cells, with 92 per cent polynuclears There was no response to large doses of quinine given over a period of three weeks

The upper margin of hepatic dulness was noted to be irregular and it was thought that there might be a hepatic abscess There were signs, too, of infection of the lungs there being lack of resonance, with crackling râles at both bases behind Accordingly three weeks after admission the liver was punctured in several different places, but no pus was obtained Five weeks after admission the Wassermann reaction proved to be strongly positive Within three days of giving anti-syphilitic treatment the fever disappeared and convalescence became established The dulness at the bases of

the lungs persisted for three weeks longer, but ultimately entirely disappeared.

The second case was a man, aged twenty-four years, who was suddenly seized with severe abdominal pain and vomiting. The pain had persisted for a week. The vomiting was incessant for four days, and was followed by hiccough which lasted for three days. The previous health had been good, except that two years ago he had a somewhat similar attack of pain and vomiting, which lasted in all for three days. There was no history of dysentery.

On admission he was very restless, and complained of abdominal pain. There was jaundice and tenderness on palpation below both costal margins. The liver area was not enlarged. A rather ill-defined mass was palpable just to the right of the mid-line in the region of the gall-bladder. The upper margin of hepatic dullness was at the fourth rib. The motions were loose. The temperature ranged from 98 degrees to 101.2 degrees F. The leucocyte count varied from 13,700 to 19,000.

A surgeon was consulted and advised exploration. But as the Wassermann test proved to be strongly positive, operation was postponed and the patient put on antisyphilitic treatment. From this point onwards his condition began to improve. The leucocyte count became almost normal. The fever, however, persisted for about four weeks longer, but this was probably due to the lung condition. Ultimately the patient made a good recovery.

The positive Wassermann reaction, and the rapid response to antisyphilitic drugs, would seem to indicate that the spirochete of syphilis was the important factor.

Insulin and Diabetes

Address by Sir Charles Sherrington, G.B.E., President of the Royal Society at the anniversary meeting of the Royal Society on St Andrew's Day (November 30, 1922). *Brit Med J*, December 9, 1922, p. 1139.

In the Physiological Laboratory of Toronto University has been prepared a pancreatic extract possessing striking powers over the carbohydrate metabolism of the body. Potent as it is, experience with it is still limited.

"Destruction of the pancreas is well known to produce in the dog a diabetes-like condition, rapidly fatal. The liver's store of glycogen is lost, and cannot be renewed by even liberal supply of its normal sources carbohydrate food. Sugar formation from proteins ensues with rapid wasting of the tissues, at the same time the blood is surcharged with sugar, and the tissues are unable to make use of sugar. In a normal animal, glucose put into the circulation raises the ratio of CO₂ expired to oxygen absorbed, because the tissues consume the sugar. But glucose similarly introduced into the depancreated diabetic animal does not raise the respiratory quotient, the tissues no longer consume the sugar.

"The inference has long been that the pancreas produces some substance enabling the body to make use of sugar—some substance that in fact should control certain forms of diabetes. At Toronto there seems to have been secured the extraction of that substance.

"The pancreas consists of two structures intimately commingled the one, secreting cells set round ducts into which they pour the pancreatic juice, potently digestive, the other, scattered in tiny islets seemingly unrelated to the ducts though closely related to the blood channels. The want of success of pancreatic extracts in mitigating a diabetic condition might be due to digestive powers of the juice cells destroying an antidiabetic substance of the islet cells. Dr F. G. Banting determined to avoid this possibility by preparing extracts made from the pancreas after its trypsin-secreting cells had been selectively brought to atrophy by ligation of the gland ducts.

"He and Mr Best, a collaborator who joined him, overcoming formidable difficulties of technique, succeeded in preparing the required material, and in ex-

amining the effect of the extract upon diabetic depancreated dogs. They found the sugar fall both in the blood and urine, and that the animals, instead of dying in three weeks, remained, while treated, in excellent condition. The further prosecution of the work subsequently engaged other collaborators, to mention them in alphabetical order, Collip, Hupburn, Latchford, Macleod and Noble, of these Professor Macleod, himself Director of the Toronto Physiological Laboratory, is well known as a skilled authority in experiments on carbohydrate metabolism, and Dr Collip is Professor of Biochemistry in the University of Alberta, though temporarily working at Toronto. With team work advance has proceeded relatively quickly, and successful extracts are now obtained from the ordinary ox, sheep, and swine pancreas.

"Of much physiological interest is the fact that the active principle in the extract seems one normally controlling the blood sugar in health, its injection rapidly lessens the blood sugar in normal animals. The extract, added to a simple perfusion fluid containing a little glucose and streamed through the isolated rabbit heart, increases three- or four-fold the heart's uptake of sugar from the fluid. The extract sometimes evokes serious nervous disturbances seemingly associated with extreme fall in the amount of the blood sugar. Administered to diabetic depancreated animals, the extract brings about reappearance of the liver's glycogen store, while bringing down the sugar excess in the blood and the excretion of sugar and acetone in the urine, and it enables the diabetic organism to consume sugar. It also lessens or prevents hyperglycaemia produced in animals in several other ways. Gratifying success has already attended the use of this extract in the relief of diabetic patients, much further research is, however, yet needed for development of the methods of extraction and of the routine use of the active principle.

"The important physiological advance thus just reached comes as a fit reward to those who have achieved it. It is, of course, the striking crowning of steady work pursued by many various workers through many earlier years. Such work, we may remember, lay often open to charge by the unenlightened of being merely academic and fruitless, its reward being at the time simply the intrinsic scientific interest of the facts obtained. The Toronto investigators, we may be sure, would say with Pasteur, 'To have the fruit there must have been cultivation of the tree.' Part of the merit of the recent successful investigation has been its appreciation of possibilities indicated by previous work. But that merit is after all only a preliminary to the main achievement. The actual achievement is the deserved success of a bold attack conducted with conviction and determination, and carried through in the face of formidable experimental difficulties. High praise is due to Dr Banting and Mr Best and to their collaborators."

The Possibilities of Intramuscular or Oral Treatment of Kala-Azar.

At a meeting of the Medical Section of the Asiatic Society of Bengal on December 13, 1922, Dr U. N. Brahmachari, read a paper on—

"Some New Amino-Antimonyl Tartrates and their Therapeutic Value."

The compounds dealt with were—(1) Phenocoll, (2) Anaesthesin, (3) Apothemin, (4) Novocaine, (5) Orthoform and (6) Acriflavine—Antimonyl Tartrates.

Dr Brahmachari commented upon the trypanosomicidal actions of antimonyl basic salts and the anaesthetic properties of the amino group. He had sought to so combine these elements as to produce antimonyl tartrate derivatives which would have a therapeutic effect and yet be suitable for intramuscular or oral administration. Orthoform-antimonyl-tartrate seemed suitable for administration by injection. The antimony content of the new preparations was 21, 23, 25, 26 and 29 per cent., respectively. Anaesthesin-antimonyl-tartrate might prove a suitable salt for oral administration, the anaesthesin prevented vomiting doses of from $\frac{1}{2}$ to 2 grams could be tolerated orally, and after them antimony was

found in the urine and therefore absorbed into the system. The toxicity of these compounds to experimental animals was less than that of potassium and sodium antimony tartrates. Bismuth-antimony-tartrate was another drug which might prove suitable for oral administration whilst acriflavine antimony tartrate, in which the chlorine was replaced by antimonyl tartaric acid, might prove the most valuable of all the pentavalent antimony compounds.

In a discussion on Dr Brahmachari's paper Dr L E Napier said that he would much like to hear of the therapeutic results with the new compounds. He was certain that Dr Brahmachari was right in sticking to the tartrates for some reason antimony seemed of little therapeutic value in kala-azar unless administered as a tartrate. Stibacetin for example was useless. The antimony molecule *per se* seemed inactive unless associated with the tartaric acid molecule. He had at present under test a new antimony compound from Messrs Allen & Hanbury, for intramuscular use. So far its administration had given rise to no thickening and no pain. Four cases had been given a full course of injections, but still shewed abundant *Leishmania* on spleen puncture. The preparation had a big molecular weight, and contained 30 per cent of antimony. He would very much like to be favoured with some of Dr Brahmachari's new compounds for therapeutic trial. At the same time he was rather doubtful about the value of compounds of large molecular weight the antimony in them did not seem to dissociate and get at the parasites.

Major H W Acton, I.M.S., pointed out that diffusibility was of first importance in such lines of treatment. Compounds with big molecular weight diffuse badly and this may explain the failure of such higher antimony derivatives. Argument from analogy was often dangerous. A herpetomonad, such as *Leishmania donovani*, was as different from a trypanosome, as a guinea pig from a monkey, one possessed no undulating membrane or tail the other did. Nothing but carefully controlled therapeutic results could count.

In replying Dr Brahmachari said that he hoped to shortly publish the results of two cases fully treated with urea stibamine. These cases had been cured successive monthly spleen puncture films and cultures being negative. Both antimony and acriflavine had first come into prominence on account of their trypanosomicidal value. Arsenic compounds acted best when the arsenic was present in AsO form possibly the most useful therapeutic compounds of antimony would be found to be those where the antimony was present in SbO form.

Psycho-Analysis

By LORD DAWSON OF PENN, G.C.V.O., C.B., M.D.,
Brit Med Jl, October 28, 1922, p 782

THE general practitioner finds it hard to decide as to the merits or demerits of psycho-analysis the remarks of Lord Dawson on the subject are of special interest. The following are a few extracts—

"The newer psychology is accepted by widening circles of the laity and a group of medical specialists, but is regarded with doubt if not with aversion, by the bulk of the medical profession.

Psycho-pathology is a serious science with a real and useful application to medicine, psycho-analysis comprises (1) the theory of the working of the unconscious mind, (2) the practice whereby the unconscious mind can be explored. A theory or hypothesis put forward by a brilliant thinker and supported by a wealth of investigation cannot fail to enrich knowledge, irrespective of its truth or falsity, provided it is expounded by those who are fitted to do so, and it is widely accepted that the theory of the unconscious mind is a great work likely to exercise influence both on medicine and education. But if—as has happened here—all sorts and conditions of people delve into the subject, confusion of thought and disturbance of mind must result.

But when it comes to the practice of psycho-analysis a much more serious position arises. Here we are dealing with a highly specialised method of diagnosis and treatment which cannot be said to be without effect, either for good or evil or both, on the patient. Admitting that psycho-analytic treatment has its sphere of usefulness under conditions of such complexity, it is the habit in our profession for the treatment to be undertaken only by workers with specialized training, which ensures skill, restraint and good judgment. Too many of the practitioners of psycho-analysis are fanatics who have no eyes for anything outside their narrow cult. This is unfair to competent and serious workers, who thereby get misrepresented. Psycho-analytic treatment calls for special caution. Its duration is both long and uncertain. This is a great strain on the mind of the patient who lives with a quickening sense of his own abnormality and if the treatment does not suit him the danger of doing him damage is intensified. The operator (analyst) cannot control with precision the range of his operation beyond the happenings he wishes to induce, others may result which are unsought and detrimental. Psycho-analysis induces and aggravates introspection, and is apt to produce morbid ideas.

The dominant position asserted for primitive sex impulses in the causation of repressions aggravates the difficulties of psycho-analytic treatment. All medical men know how quickly by introspection 'sex' will monopolize attention, distort judgment, and pervert conduct.

There is a factor in psycho-analytic treatment which presents difficulties of its own, 'transference,' which means that emotions and fantasies awakened in the patient by the analysis are detached from their original associations and reincarnated in the analyst, who thus becomes a partner in the life of the patient. Is not such a relation of physician to patient putting too big a strain on human nature and might not positions of danger be provoked? The conclusion is the recognition by the profession of the increasing importance of the study of the mind in health and illness. Within the fold that study will regain the perspective and restraint which in its present position of isolation it has lost."

Blood Transfusion in Civil Practice

Brit Med Jl, December 2, 1922, p 1078

MR GEOFFREY KEYNES said that there were at present two schools of technique, one of which held that whole blood was the more desirable, while the other insisted upon the use of an anti-coagulant. Whole-blood methods were satisfactory in the hands of those accustomed to them, but anti-coagulant methods, depending upon the employment of solutions of sodium citrate, were most satisfactory for general use, and it was these which had popularised transfusion. A good many fatalities followed transfusion in former years and it was probable that in most of these cases incompatibility of bloods was the responsible factor. Post-transfusion reactions were occasionally severe, owing to gross incompatibility but there were also a number of slight reactions following the transfusion of compatible bloods, and the suggested causes for these were (1) the anti-coagulant, (2) incipient clotting, (3) effect of anaesthetics on serum, (4) 'minor agglutinins', (5) protein shock, (6) distilled water for dissolving anti-coagulant.

These slight reactions were of no very great importance, he had never seen them interfere with the efficacy of the method, and it was not necessary to be alarmed even with a rise in the pulse rate to as high as 150. The disquieting thing about these moderate reactions was that they could not be eliminated even by the most careful grouping of bloods but they did not seem to happen often enough to make necessary the abandonment of transfusion on account of this danger. It was well never to use the same donor twice, if possible and to ensure that blood of the same group as that of the recipient's blood was always used. He classified the indications for transfusion as follows (*italics indicate that in those*

cases transfusion is of less importance or of doubtful value)

Hæmorrhage and Shock Traumatic hæmorrhage, ectopic gestation, post-partum hæmorrhage, gastric ulcer, etc.

Pre-operative Debility or cachexia, hæmorrhage

Post-operative Following severe operations Cases involving much loss of blood are more benefited than those suffering purely from post-operative shock

Hæmorrhagic Diseases Hæmophilia, melena neonatorum, jaundice, purpura

Blood Diseases Pernicious anæmia, leucæmia
Toxæmias Pyogenic, severe burns, carbon monoxide and nitrobenzol and benzol poisoning

Blood transfusion was a very useful therapeutic measure, though its limitations were quite definite. In England its use is restricted owing to the absence of any system of professional donors, such as existed in America and possibly also to an exaggerated idea of the technical difficulty

Improvements in Pre-Operative and Post-Operative Care

By F B TAYLOR, M.D., W I TERRY, M.D., and
W C ALVAREZ, M.D.,

Jour Amer Med Assn, No 4, 1922, p 1578

UNTIL 1919 it was customary at the University of California Hospital to give a dose of castor oil the night before operation, and enemas in the morning. At that time Dr Terry discontinued the routine purgation, but left the order for enemas. The general impression was that the post-operative recoveries are on the average more satisfactory, and that there is less vomiting, abdominal distention and pain. In 1918 Alvarez suggested that it would be wise also to abolish the routine purge usually given on the second or third day after operation.

The conclusions are based on records from 211 patients. Of these, 146 had abdominal, and sixty-five had extra-abdominal operations. The salient points brought out are (1) The omission of the pre-operative purge had no definite influence on the amount of vomiting, but it had a decided effect on the amount of pain in the abdominal cases, reducing its incidence from 75 to 42 per cent., (2) the delay in giving the post-operative purge had a decided effect on the amount of vomiting, reducing its incidence from 15 to 30 per cent in the abdominal group, and 20 to 4 per cent in the extra-abdominal group, (3) in both groups, there was more complaint of pain when the post-operative purges and enemas were withheld. The authors believe that this means that a number of persons will be more comfortable if given enemas as soon as they are needed to help in the passage of gas.

The nurses have much less work to do under the present routine. There is less carrying of bed pans, there is less moving of people and there is less soiling of patients and beds. Twenty patients were allowed to go for at least six days after operation without receiving purges or enemas. None of these patients showed any ill effects and several of them had spontaneous bowel movements within the period of observation. In the others an enema on the sixth day had good results. It would seem that a surgeon need have no fear about neglecting his patients' bowels after operation.

The Action of Carbon Tetrachloride on the Liver

By J F DOHERTY, B.A., M.B., Toronto
and

E BURGESS

Brit Med J, November 11, 1922, p 907

Two condemned men were treated with 5 c.c. of carbon tetrachloride and one with 8 c.c. in two doses of

5 and 3 c.c. The anthelmintic was given on an empty stomach. No 1 received a post-purge of 1 oz of saturated magnesium sulphate solution three and a half hours later, No 2 received the same eight hours after treatment, while No 3 received none, having vomited the first and declined the second. The following is a report of the examination and findings. The victims were healthy when first examined.

	Prisoner 1	Prisoner 2.	Prisoner 3 *
Date examined	July 15	July 31	July 31
Fæcal examination			
Anky duod	Positive	Positive	Positive
Ascaris lumb	Positive	Positive	Negative
Trichuris	Positive	Positive	Positive
Oxyuris verm	Negative	Positive (heavy)	Positive
Date of 1st treatment	July 16	August 1	August 1
Breakfast	Tea only	Nothing	Nothing
Hour treated	9 a.m.	8 a.m.	8 a.m.
Amount CCl ₄ given	5 c.cm.	5 c.cm.	5 c.cm.
Tiffin	10 30 a.m.	10 30 a.m.	Declined
Condition of patient	11 a.m., dizzy	10 a.m., dizzy	11 a.m., dizzy, nauseated
Purge	12 30 p.m.	4 p.m.	4 p.m. vomited at once
Worm count in 24 hour collection			
Anky duod	211	33	No movement in 24 hours
Ascaris lumb	Negative	2	
Trichuris	Negative	Negative	
Oxyuris verm	1	93	
Post-treatment examination of fæces			
Anky duod	No examination	Negative	Negative
Ascaris	—	Negative	Negative
Trichuris	—	Positive	Positive
Oxyuris	—	Positive	Negative
Examination of bowel contents			
Anky duod	Negative	Negative	Negative
Ascaris	Negative	Negative	Negative
Trichuris	9	12	Negative
Oxyuris	Negative	17	14
Liver			
Macroscopically	No change evident	Slightly friable	Very friable
Microscopically	No well-defined change	Granular degeneration of liver cells	Fatty degeneration of liver cell
		Leucocytic infiltration	Diffuse leucocytic infiltration
Kidney			
Macroscopically	No change evident	No change evident	No change evident
Microscopically	No change evident	No definite change	Cloudy swelling of proximal tubes

* No 3 had a second treatment on August 14th consisting of 3 c.c. of carbon tetrachloride on an empty stomach followed by a meal 2½ hours later. No purge was given.

The anthelmintic thus produced lesions in the liver in two cases, on this account it seems inadvisable to prescribe even a 5 c.c. dose with purgation, let alone without. A safe maximum dose seems to be 3 c.cm., since it has been given to a number of patients in Ceylon without producing any feeling of discomfort though so far no autopsy has been performed on any individual so treated.

RESULTS IN SECONDARY SYPHILIS

Action on the Treponema—In the simple mucous plaque the treponema has disappeared on an average in four days with the administration of 0.24 gm of 132.

Action on the Lesions—As a rule the roseola disappears after two or three injections, often after Herxheimer's exacerbation. The papillary roseolæ and the mucous plaque disappear in 8 to 18 days from the commencement of the treatment. The same may be said of ulcerated surfaces (precoce syphilis maligne) and the healing is rapid. A case of facial paralysis with double auditory paralysis occurring with a roseolate rash was cured in 20 days.

DOSAGE AND EFFECT ON BORDET-WASSERMANN REACTION

In general the cure is effected by 24 injections of 0.12 gm in 55 days, and with a negative Wassermann result. Patients have undergone a consolidation treatment as with other arsenical preparations. A case of mucous plaque that did not yield to novarsenobillon in strong doses was healed after six injections. On the other hand, another patient who had not benefited by other anti-syphilitic treatments also resisted the effects of 132.

Latent Secondary Syphilis—The author has brought about consolidation cures that were negative with regard to the Bordet reaction.

TERTIARY SYPHILIS

Deep lesions (gumma, ulceration) have been healed on an average in 15 to 20 days.

TREATMENT OF LATE NERVOUS SYPHILITIC CONDITIONS

132 is very well tolerated in cases of tabes and general paralysis. It has a good influence in cases of tabes, but it must be clearly understood that its effects are not reliable in cases of general paralyses.

TREATMENT WHEN INTRAVENOUS INJECTIONS ARE NOT TOLERATED

This is one of the most important points in the author's work. Where the intolerance is not great—a temporary febrile reaction after novarsenobenzol intravenous injections for example—patients stand 132 without any rise in temperature. Several patients who had acute, generalised, and immediate eruptions after small intravenous doses of novarsenobenzol supported the 132 treatment without inconvenience. On the other hand, certain patients with exfoliating erythrodermas had the same accidents after treatment with 132. These were cases of hepatic insufficiency with over-acidity who could not even endure sodium cacodylate or Fowler's solution. Cases with cardiac affections and with tuberculosis have borne the treatment without bad effects, whereas they could not endure intravenous injections. The same may be said of certain cases of albuminuria, though here other cases have found 132 no more tolerable than the other forms of arsenic.

It is in the cases of the nitritoid crisis following each intravenous injection that 132, when injected into the muscle has given the best results. The patients have never had any crisis, even when no adrenalin was employed.

CONCLUSIONS

The therapeutic trials made with amino-arsenophenol (132 Pomaret), or eparseno, prove that by intramuscular injections a sufficient quantity of arsenic can be given to be efficient. Whilst avoiding the phenomena of shock, this method ensures rapid absorption of the medicament followed by a slow but sufficient elimination, thus avoiding the effects of accumulation (in the first sample of urine collected after an intramuscular injection the presence of the medicament is revealed by the nitrogenous reaction).

2 It is also possible to employ 132 with intramuscular injections for the rigorous treatment of recent syphilis,—by giving during the first weeks larger doses than would have been possible with intravenous injections.

3 Those who cannot support the intravenous treatment stand this method very readily. Nevertheless, it is necessary to first make sure, as with all active treatments, whether the patient's renal and hepatic functions are normal and whether he is unable to endure even a small dose of arsenic.

4 For the prolonged treatment of old cases of syphilis, nervous syphilis etc., the easy technique is a special advantage with 132.

Observations on Spinal Anæsthesia.

By D N KALYANVALA, M.R.C.S.,

Reprint from the Edinburgh Medical Journal, 1922

THIS short monograph deals with the experiences of spinal anæsthesia in 81 consecutive cases. The author first details his technique, wherever possible he prefers to first induce omnipon-scopolamine analgesia. The blood pressure and then the intra-spinal pressure are next taken,—the latter by a special form of manometer devised by the author and made by Messrs Allen & Hanbury. He prefers 10 per cent. stovaine to other injections, and regulates dosage in accordance with intra-spinal pressure. In operations below the level of the umbilicus he injects between the 2nd and 3rd lumbar spines, or for operations above the umbilicus between the 12th dorsal and 1st lumbar spines, in which latter case A.C.E. or ether administration is advised as an additional procedure.

Dealing with difficulties in spinal anæsthesia the author comments on difficulties in entering the theca,—where he advocates making the puncture almost vertically in the central line on uncertainty of action, disturbances of respiration, fall of blood pressure, secondary or post-operative shock,—where he advises against spinal anæsthesia for any patient with a blood pressure below 100 mm,—and vomiting. Post-operative headaches are fully dealt with and such after effects as nervous lesions and transient albuminuria. The article closes with tabulated details of the 81 cases in which this method was used. Dr Kalyanvala's small monograph is essentially practical and useful in character, and should be consulted by all who desire to practise this most useful form of administration of anæsthesia.

Persistent Pain in Lesions of the Peripheral and Central Nervous System

By Dr W HARRIS, M.D.

*Proceedings of the Royal Society of Medicine
Section Neurology April, 1922, p 13*

A COMPLETE exposition by Dr Harris of the methods and results of alcohol injections in cases of severe neuritis, together with detailed histories of many cases is a valuable contribution to medicine, since he has made the method especially his own. Following a classification of such persistent pain into pain due to (1) inclusions of nerve endings in scars, (2) disease involving nerve trunks, (3) lesions of the posterior nerve roots or posterior root ganglia, (4) central sclerosis of the fillet or thalamus, and (5) psychalgias, he deals in turn with neurofibrositis, chronic paroxysmal trigeminal neuralgia, geniculate neuralgia, glossopharyngeal neuralgia, causalgia, brachial and sciatic perineuritis and psychalgias. The paper is chiefly of importance by reason of the numerous cases cited in detail. His analysis of paroxysmal trigeminal neuralgia deserves to be quoted in full—"Chronic paroxysmal trigeminal neuralgia is certainly of peripheral origin, and is probably due to septic neuritis of nerve filaments in the maxilla or mandible. Scarcely ever does this disease affect the upper division and supra-orbital alone but it may be involved along with the second division."

John Fothergill's original description nearly one hundred and fifty years ago of the painful attacks is scarcely to be improved upon to-day, though his view of its pathology, that the origin must be cancerous,

because of the long-standing pain, is now discarded. Many causes appear to contribute to its appearance. Heredity of the disease I have met with in about 1 per cent. of my cases. Strong emotion may precipitate an attack. Injury and blows on the jaw are a not infrequent cause, as may also be exposure to severe chill, as in motoring or driving, a septic intrum has preceded typical tic douloureux of the second division too often to be a coincidence. I find the disease twice as frequent in women as in men, a point also noted by Fothergill though he saw only sixteen cases in his practice. A curious point shown by my statistics is that the disease is twice as frequent on the right side as on the left, and commoner in the upper than the lower jaw, though both are often affected. The larger incidence on the right side may be due to better use of the toothbrush on the left side of the mouth, as would be natural in right-handed people. According to Mr Warwick James, bilateral trigeminal neuralgia is comparatively rare. I have met with it perhaps thirty times only among several hundreds of cases. The disease rarely disappears spontaneously when established. I have known this to occur only once, in the father of a sufferer from this disease, who was my patient. Her father suffered for twenty-five years until he was aged 90, but was free for the last fifteen years of his life, living to 105. In the early stages, however long periods of remission may occur, I have known thirty years elapse between the first and second attacks, and intervals of one to two years are common. Sometimes a certain periodicity is seen, as for a few weeks to three months every autumn or winter. As the years pass, usually the intervals of freedom get shorter. In a few there is practically no remission, agonizing pain inevitably following every movement of the face, as in eating or in washing. One of my patients, a lady, had been unable to wash the right side of her face for twenty years. Often the slightest touch of a hair or draught of air will start a paroxysm, though at other times nothing may provoke the pain. During the painful bouts the prick of a pin usually seems more acute on the affected side, though this is a temporary hyperæsthesia only, and is not present between the attacks.

Fothergill, 150 years ago, thought hemlock pushed to toxic doses was a cure for this complaint, but our experience nowadays is that drugs are comparatively rarely of service, and that real relief is obtained only by a solution of continuity of the offending nerve trunk. Practically the choice, in severe cases of pain, is between gasserectomy, or division of its sensory root—both severe operations—on the one hand, and alcohol injection of the nerve trunks at their deep foramina, or injection of the ganglion itself on the other. For bilateral cases of this neuralgia the gasserectomy operation is not permissible, owing to the jaw drop that would ensue, though bilateral destruction of the ganglion by injection may be done, as the motor root then recovers, though the sensory ganglion cells are permanently destroyed. A curious point I have often noticed when injecting the foramen ovale and ganglion is that the ophthalmic or inner portion of the ganglion becomes totally anæsthetic before the second division and it may be extremely difficult at times to get total anæsthesia of the cheek when the forehead and eyeball remain perfectly anæsthetic. I have no satisfactory reason to account for this.

Another form of persistent trigeminal pain, of which I have seen many instances, is in my experience peculiar to young women. It is continuous, not paroxysmal, though it may vary in severity, and it affects either the upper or the lower jaw. It is not provoked by eating, laughing, washing or other movements of the face as in the case of true tic douloureux. It is more difficult to relieve by alcohol injection than spasmodic tic douloureux, as total anæsthesia is necessary to abolish the pain, and with commencing regeneration of the nerve the pain recurs. In tic douloureux, however, in a large majority of cases, a medium anæsthesia from injection may be sufficient to abolish the pain, in some cases for many years, in one of my early cases there has been

no recurrence 12½ years after injection of the foramen ovale, though only light anæsthesia now remains.

This lady had previously suffered from typical tic for twenty years, section of the inferior dental nerve having given only two years' relief. In her case the neuralgia commenced at 17, and I have seen it commence at 17 in two other cases and once at 16, many in the twenties but most commonly about the age of 50. On the other hand the type of persistent neuralgia of upper or lower jaw perviously described I have met with only in women of 15 to 35. I am very uncertain about its cause, unless it be a chronic osteitis of the jaw. Its limitation to women I do not understand, as the sufferers I have met with have not been notably of the neurotic type. Moreover, the true tic douloureux is undoubtedly much more frequent in women than in men, about two to one. These cases are more difficult to treat than true trigeminal neuralgia, as nothing short of total nerve destruction cures the pain.

Dr Harris' results are so brilliant that his methods are well worthy of study. The injection of a few minims of 90 per cent alcohol into the tender areas in neuro-fibrosis is often followed by complete relief. In severe tic douloureux alcohol injection of the foramen ovale has been known to afford complete relief for as long as 12 years. In obstinate supra-orbital neuralgia it may be necessary to inject the Gasserian ganglion. In chronic sciatica lateral scoliosis is sometimes present and localised tender spots may be discovered, the lesion not infrequently being a local lumbar fibrosis in the erector spinæ in the region of the 4th and 5th lumbar transverse process. Immediate and dramatic relief may sometimes ensue on local alcohol puncture of the tender area.

Dr Harris' paper should be read in extenso, together with the discussion that followed it. There can be no doubt that in many cases of intractable neuralgia alcohol injections, either into the spots of localised tenderness or into the nerve trunk or ganglia concerned,—provided that they are purely sensory and do not contain motor fibres—will afford immediate striking and often permanent relief. In acute trigeminal neuralgia alcohol injection of the Gasserian ganglion is at least an easier and safer operation than extirpation, and may be resorted to as a preliminary measure. The chief interest of the paper, however, consists in its detailed and carefully studied cases, many of them followed up during subsequent years.

Cancer of the Breast Treatment of the Proemial Breast

By SIR G LENTHAL CHEATLE

British Med J, 3rd June 1922, p 869

SIR LENTHAL CHEATLE comments on the fact that even radical operations for carcinoma of the breast so often fail. The cause is essentially the same in every case: the patient comes to operation too late. Hence he urges removal of the breast in what he terms the "proemial" state. Here he gives clear indications as to the signs and symptoms which are to be regarded as sufficient to warrant extirpation. The patient is usually from 40 to 45 years of age and has had continuous pain of an aching character for from six months to ten years. On palpation both breasts may appear to be multinodular. But in the healthy breast the multiple nodules are mainly prominent parts of the mammary ducts and can be identified as such on careful examination. In diseased conditions the nodules are swollen, painful and tender, and are not of the same size in corresponding parts of the same gland. As the condition persists pain tends to pass off but cysts are present in varying numbers and there may be traces of a thick white discharge containing desquamated epithelial cells. Pathologically the conditions present are those of desquamative hyperplasia of the glandular epithelium of acini and ducts with distension and dilatation followed by stagnation and lymphocyte accumulation around the diseased ducts.

The author removes the breast in all cases shewing such symptoms. He uses a transverse curved incision below the nipple, dissects upper and lower skin flaps, and opens the axilla. The breast and fascia over the pectoralis major are removed *en bloc* with the attached lymphatic glands, and the glands subjected to most rigorous histological examination. In one interesting case which he records a small malignant focus, clinically unrecognisable, had infiltrated fat and only microscope examination identified the existence of malignancy.

The Molteno Institute for Research in Parasitology, University of Cambridge with an account of how it came to be Founded

Parasitology, June 1922

THERE are many in the Indian services who have had the privilege of working at some branch or other of parasitology in the old Quick Laboratory at Cambridge under the ægis of Professor Nuttall. To them especially, as to all who have at heart the advancement of tropical medical science it must be most gratifying to read of the metamorphosis of that old laboratory into a magnificently equipped research institute founded and endowed by the liberality of Mr and Mrs Percy Alport Molteno, after which generous donors it is named.

To this Institute all research workers will be welcomed, as they were to the Quick Laboratory, and there can be no doubt that in the course of time a goodly band will gather there to help to illuminate the book of knowledge edited by the chief.

From a personal point of view every one will be delighted that Professor Nuttall's great efforts in the service of science should now have been thus rewarded with a place more worthy of his splendid labours, and that his services on numerous committees and in the war, his personal financial aid to his staff and to the publication of *Parasitology* and the *Journal of Hygiene* should have been thus recognised.

We can only congratulate him and wish him a long life in which he may continue to let the light of his genius shine forth before men.

Discussion on the Clinical Differentiation of Pulmonary Tuberculosis from other Respiratory Affections

Opening paper by E. RIST, M.D., Paris,
Brit Med J October 21, 1922, p 733

THIS paper by Dr Rist is of such importance that an exceptionally full abstract of it is given.

It is likely that delay in making the diagnosis of tuberculosis is a common fault in India and the mistake is sufficiently common to justify attention being called to Dr Rist's very valuable contribution to the subject.

Important changes have taken place in our knowledge of tuberculosis, owing to the experiences of the war. The "wait and see" policy was almost universally applied to lung tuberculosis, cases were for protracted periods regarded as merely suspicious, treatment was advised in many instances too late. By another school of physicians treatment was, and still is, often imposed uselessly on people who do not need it.

The skin reaction has proved that tuberculous infection is almost universal among civilised communities. The first infection generally takes place during the first fifteen or eighteen years of life but is followed by clinical tuberculosis in only a small number of cases. That a mild first infection confers an immunity which protects the majority of adults against further infection and disease is a well ascertained and generally admitted fact. The mildness of a primary infection is not due to a hypothetical attenuated virulence but to the smallness of the number of germs. Heavy infections cause severe and lethal forms of tuberculosis in children as well as in adults who have hitherto not been exposed. A posi-

tive skin reaction therefore is not a diagnostic sign of tuberculous disease, but is merely an index of tuberculous infection. The infected individuals whom the von Pirquet test discovers are more protected against subsequent tuberculous disease than the non-infected.

X-ray examination of the chest is of great value in diagnosis. Not only the so-called X-ray expert, but the clinician as well should master the technique of fluoroscopy and train himself in the reading of plates, constantly controlling the information so obtained by the ordinary physical examination and by *post-mortem* findings. Percussion and auscultation have their limitations and pitfalls, X-rays give us a definite diagnosis in many cases in which the older methods fail. The fluoroscope shows deep-seated lesions which the ear is unable to detect, it detects cavities much earlier and much more frequently than one would suspect, consolidation is shown to be more extensive than one would think, if one were guided only by the stethoscope. On the other hand, there are cases in which rales and other adventitious sounds suggest an extensive lesion in which X-ray findings show that we are dealing with bronchial catarrh without any consolidation.

There has lately been a tendency to attach much importance to the demonstration of tubercle bacilli in the sputum. Repeated and conscientious sputum examination is needed. Not many years ago, when physical examination elicited the signs of a lung lesion, and when some of the symptoms such as fever, hemorrhage, coughing and wasting were present, one thought oneself justified in considering the diagnosis of tuberculosis certain, even if no bacilli could be demonstrated. In a case of open lung lesion where no bacilli can be found we ought to think of the possibility of a disease other than tuberculosis.

The upper respiratory passages have their importance, their infections, catarrhs, and mechanical obstructions influence the bronchial tree quite as naturally as the maladies of the urethra and prostate influence the bladder and kidneys. The records of a tuberculosis clearing station at Compiègne in 1916 show that out of 192 men sent in with a diagnosis of lung tuberculosis from various army units, ambulances, or hospitals, and kept under observation, the diagnosis was justified in 53 cases only (or 27.5 per cent). Of ex-service men who applied in Newcastle for sanatorium benefit between the years 1913 and 1919, out of 287, 167 had bacilli in their sputum and 120 had none. Of those 120 men, 91 (or 75.8 per cent) were ultimately proved to be non-tuberculous. Among the 167 who had bacilli 53 died, among 120 whose sputum was free from bacilli 4 only died, the causes of death in these 4 cases were respectively bronchiectasis, influenza, sarcoma of the lung, disseminated tuberculosis.

The commonest diseases which are often mistaken for lung tuberculosis fall into three groups.

The first includes ailments not caused by diseases of the respiratory system but showing symptoms similar to those found in these diseases. It is important to remember that dyspnoea, fever, cough, thoracic pain and hæmoptysis etc., are also symptoms of diseases of the cardio-vascular system. For example, hæmoptysis is often caused by mitral stenosis and fever may be a feature of malignant endocarditis.

The second group consists of non-tuberculous diseases of the lungs and trachea whose signs and symptoms are identical with those of some form of pulmonary tuberculosis. Such are syphilis of the lung which has absolutely no signs peculiar to itself and therefore it is almost regularly regarded as tuberculosis, until repeated negative examinations of the sputum for bacilli arouse suspicion. Cancer of the lung or bronchi is not exceptional. The diagnosis is always difficult, almost all cases of lung cancer have been regarded as cases of consumption and only careful X-ray examination and the absence of bacilli in the sputum show the nature of the disease.

Bronchiectasis is more common than either syphilis or cancer of the lung. One must remember that for many years a bronchiectasis may give rise to a secretion which is not only non-offensive, but intermittent. Sud-

den and profuse hæmorrhage as well as slight and prolonged expectoration of blood are also by no means unusual. The physical signs are those of focal consolidation with a central cavitation. The classical axiom that apical cavities are tuberculous, whereas cavities at the base are usually due to bronchiectasis is one of those traditional golden rules which are just approximate enough to be dangerously misleading. Apical bronchiectases are not exceptional, nor are basal tuberculous cavities. The third group includes morbid conditions of the upper respiratory passages which very frequently give rise to mistakes. The common cold is a mild infection of the nasal cavities which easily spreads to the pharynx, the larynx, the trachea, and the larger bronchi, causing cough with expectoration. It is strange that most people overlook the very great probability that chronic infectious conditions of the upper air passages should do the same. Antrum suppurations, purulent discharge from the ethmoidal, frontal, or sphenoidal cavities, adenoids, hypertrophy of the pharyngeal, lingual, or palatine tonsils are examples. More frequent still are those minor abnormalities which are not infectious but which predispose to benign infectious catarrhs, such as hypertrophied turbinates or deflected septa.

The connection between infections of the upper respiratory organs and chronic coughs with occasional signs of disseminated or localized bronchitis is very important, it is surprising how often the curetting of an antrum the withdrawal of an hypertrophied turbinate bone, the removal of adenoids or of hypertrophied tonsils cure old standing apical catarrhs or bronchitis or suspected incipient tuberculosis. Over 50 per cent. of the cases reported by the author as non-tuberculous after observation in the diagnostic clearing stations conducted during and after the war belonged to this class of patients. Too great importance is generally given to symptoms, loss of appetite, weight or strength, shortness of breath, cough, expectoration, fever, all these belong to an extraordinarily large group of morbid conditions hæmoptysis occurs in every focal non-tuberculous disease of the lung, such as syphilis, cancer, bronchiectasis, gangrene and abscess of the lung, its diagnostic value in mitral stenosis and in malignant endocarditis is well known.

After analysing the symptoms, percussion, auscultation and other methods of physical examination must be applied with an open mind. The physician should ask himself the question—Is there either in the lung or elsewhere, a localised lesion which may account for the symptoms observed? If the signs of a localised lesion are found in the lung, we may proceed to diagnose the specific nature of the lesion by using the tests which are at our disposal. As regards tuberculosis, there is only one positive test—namely the finding of tubercle bacilli in the sputum. One negative result means nothing, but ten negative results mean a lot, if the search for bacilli has been prolonged, if the sputum has been homogenised, and if animal inoculation has not been neglected. Our duty in the absence of bacilli is to endeavour earnestly to ascertain whether some disease other than tuberculosis may not account for the symptoms and signs observed.

ANNUAL REPORTS

EXTRACT FROM THE ANNUAL CLINICAL REPORT OF THE GOVERNMENT MATERNITY HOSPITAL, MADRAS, 1922

The total number of patients treated was—

I—Obstetric—2,536

II—Diseases of pregnancy and gynaecological cases—3,516

Maternal mortality—Of the 2,488 women (excluding the 45 who remained from 1920) whose deliveries are included in these statistics, 55 died

DEATHS

The causes of death are classified under the following headings—

- I—Accidents of childbirth
- II—Puerperal causes
- III—Non-Puerperal causes

I—Accidents of child birth

1	Eclampsia	6
2	Rupture of uterus	3
3	Adherent placenta	5
4	Prolonged labour and exhaustion	1
5	Shock and exhaustion after operation	3
6	Post-partum hæmorrhage	5
7	Hyperemesis gravidarum	1
		<hr/> 24

II—Puerperal causes

1	Septicæmia after natural or instrumental deliveries or other causes	10
		<hr/> 10

III—Non-Puerperal causes

1	Anæmia	6
2	I. D. H.	1
3	Albuminuria	1
4	Pneumonia	6
5	Hyperpyrexia	3
6	Diarrhoea	2
7	Small-pox	2
		<hr/> 21

Administration—(a) Medical Staff—Major C. A. F. Hingston, O.B.E., I.M.S., was in charge of the hospital throughout the year and has been assisted by Dr. A. Lakshmanaswami Mudaliyar, Assistant Superintendent, throughout the year. Dr. C. T. Verghese, Resident Medical Officer, from 1st January to 31st July 1921 and Dr. Shillong I.M.D. Resident Medical Officer, from 6th September 1921 to the end of the year were working in this hospital. Military Assistant Surgeon W. S. Martin, I.M.D. has also worked in the hospital from 1st August 1921 to the end of the year. Civil Assistant Surgeons G. Bhavani Shunker, P. Achyuta Menon and Balasubramanya Nadar and Sub-Assistant Surgeons C. K. Madhusudhana Rao and R. S. Visvanatha Ayyar, have worked in the hospital.

Temporary Lady Assistant Surgeon Miss R. C. Bakiam worked in this hospital throughout the year under report.

(b) Nursing Staff—Mrs. F. M. Guy, C.M.B., has been in charge assisted by 14 European Staff nurses and 10 Indian Staff nurses.

The school for Nurses has been enlarged and 40 European probationers and 65 Indian nurses have been trained during the year.

LEAGUE FOR COMBATING VENEREAL DISEASES, BOMBAY

Fourth annual report, year 1921-22 66, Lamington Road, Bombay

THIS little pamphlet of 22 pages is a useful record of work of much real practical and educational value. The annual number of admissions has increased from 964 in 1918-19 to 1,518 in 1921-22, which shews that propaganda work leads to a larger number of patients seeking advice and treatment. With reference to occupational incidence Dr. Socrates Noronha draws attention to the frequency of venereal diseases in motor drivers and cleaners, who seem to receive more wages than are necessary for the necessities of life, and to the high incidence in young students and schoolboys in India. Of male patients treated 48 per cent. were married, 42 per cent. were unmarried, and 10 per cent. were young men recently married and infected prior

or co-ordination between the multiple endocrine glands, and even then the case made out for them does not convince one. Of course in these Aid Series one must always remember there is the smell of examinations hovering in the nostrils of the author, but still one is of opinion that the subject of the ductless glands is so fascinating and the literature of experiment and practice now so large that this particular volume might have been curtailed and at the same time made more readable. Even as a "cram" student's book we cannot recommend it, for it stifles one.

A TEXT-BOOK OF MEDICAL JURISPRUDENCE AND TOXICOLOGY.—By **Rai Bahadur Jaising P. Modi, L.R.C.P. and S. (Edin), L.R.F.P.S. (Glasgow),** Second edition, 460 pages. Published by Butterworth & Co, (India), Ltd., 6, Hastings Street, Calcutta

THE new edition of this book has been carefully revised and a praiseworthy attempt has been made to remedy the shortcomings pointed out in our review of the first edition. The authorities from which important statements have been taken are given at the bottom of the pages in which they occur. The section on insanity has been greatly improved and the section on toxicology is excellent. The vernacular names of poisons have been given wherever possible and this gives the book an added value. The appendices contain a lot of useful information regarding the rules of medico-legal procedure in the law courts in India. The English has been improved, but a few misprints are still present—'ires' for 'iris' on page 37, line 6. From the point of view of medical students in India the book is excellent, and we have no hesitation in recommending it. To practitioners also the book will be helpful.

OPHTHALMIC SURGERY.—By **V. Nesfield (Major I.M.S. ret.) F.R.C.S., H. K. Lewis & Co. Price Rs. 9, pp. 172.**

THIS small book is the outcome of the personal experience of the author while serving as a Civil Surgeon, and as the author says in his preface, it will be found somewhat unorthodox.

It is ambitious in scope, covering a fairly large field of eye surgery in a superficial way, but giving, in fairly full details, the author's methods of extracting a cataract in its capsule, after rupture of the zonular ligament with a special instrument. His remarks on the subject of the pathology of glaucoma would probably have been omitted if he were more familiar with Col Elliot's recent books dealing with this subject.

The general impression left after reading it is, that as the author's experience and knowledge of ophthalmic literature increases, he will probably modify to some degree the statements and recommendations made in this book, which however contains much that is useful and valuable, especially his advocacy of the old method of treating corneal ulcers threatening to perforate, by tapping the anterior chamber, which is possibly not as much used as it should be.

A TREATISE ON GLAUCOMA. By **Lt.-Col. E. H. Elliot, I.M.S. (ret.) Oxford Medical Publications. Price 30/- net.**

THIS book, the second edition of Col Elliot's text-book, is much more ambitious and complete than the original volume, and deals with the subject in a detailed manner with a mass of clinical and pathological observation, never before brought together in book form, and includes a quantity of new work, not published elsewhere in English. Maggiore, Fuchs, and Magitot's work on the anatomy of the eye in connection with glaucoma, and Koster, Bailhart, and Magitot's in connection with the physiology of intra-ocular tension and the secretion of the aqueous are very interesting and new. With reference to diagnosis, Elliot goes deeply into the question of the haloes of glaucoma, their causes

and importance, and of course lays great stress on the restrictions of the field, and scotomata in this disease, especially those made evident by his scotometer. There is little new about the treatment of glaucoma, but he describes in considerably more detail the after troubles, such as they may be, of a successful trephining (temporary loss of visual acuity, late infections, vesicular scar). The chapter on the pathology of filtration, and the histology of the trephined disc is much enlarged, and points out the great importance of getting cleanly through Descemet's membrane when operating.

As may be judged from the foregoing remarks, this book should find a place in the library of every medical man who is actively interested in the diagnosis and treatment of diseases of the eye.

MANAGEMENT OF THE SICK INFANT. By **Langley Porter, B.S., M.D., M.R.C.S. (Eng.) L.R.C.P. (Lond.), and William E. Carter, M.D., C. V. Mosby Company. St. Louis, U. S. A. 1922. Dollars 7 50.**

THE writers of this book are attached to the University of California Medical School, and have been impressed with the fact that they have been unable to find any text-book in the English language which deals exclusively with the peculiarities of disease as it occurs in infants. They have, therefore, in this work, codified the things which experience has taught them are aids in dealing with sick babies.

Their book is divided into three parts. The first deals with symptoms of disease, vomiting, pain and tenderness, constipation, diarrhoea, etc., the authors discuss, at considerable length the various causes from which these symptoms may arise, and the appropriate treatments for each condition. Routine treatments are avoided, and the student is guided into the way of working out the correct treatment by studying the causative conditions underlying the symptoms observed.

Part II contains a description of the pathological conditions which may be met with in different parts of the body, the descriptions being grouped according to the tract or system in which they occur. The appropriate treatment is given for each condition, together with much practical advice as regards prognosis and the management of the case, based on clinical experience.

Part III is concerned with methods. The various methods used in the treatment of the sick infant are well described and clearly illustrated by photographs. The equipment needed and actual procedure are detailed in every instance, the special points requiring notice when dealing with an infant patient being emphasised. A chapter on formulas and recipes, and another on drugs with suitable prescriptions for the various diseased conditions already described complete a book which should be within easy reach of every busy practitioner who is called upon to treat young children.

NUTRITION AND GROWTH IN CHILDREN. By **William R. Emerson, M.D., D. Appleton and Company, New York and London. 1922. Cloth, 10s. 6d. nett.**

ONE-THIRD of all the children in the United States are said to be under weight for their height, under-nourished, and malnourished. This condition is found alike on the east side of New York among the well-to-do in such cities as Boston and Chicago, and in all classes of society, as shown by a series of investigations extending from Labrador to Atlanta. A similar situation was disclosed by the examinations for the army where approximately the same proportion of recruits was found unfit for military service because of conditions largely due, directly or indirectly, to malnutrition.

Dr Emerson, known in the States as a pioneer in nutrition work, and one of the first to lay emphasis on the other important factors besides diet concerned in this problem, has in this book given the results of his experience for the benefit of parents, teachers, social workers, and physicians. He explains the chief causes

of malnutrition, physical defects, lack of home control, overfatigue, improper diet, faulty food habits, and faulty health habits. The way to identify the malnourished child is described, the method of the physical-growth examination detailed, and the mental test given.

The second part of the book which describes malnutrition and the home, will be of especial interest to parents and all who have the direction or control of child life. The essentials for health are clearly stated, and the problems of home control and over-fatigue dealt with. The chapters on measured feeding, diet and food habits, health habit, exercise and recreation, though containing much advice not directly applicable to conditions in India, will yet be read with interest as indicating the lines on which work may be developed.

Part III, a nutrition programme for the community, might well be recommended to those who, in this country, have the direction of our civic life. Members of the provincial councils and of municipalities who are concerned with the financing of schools and education in India, who would read the information here given regarding the nutrition class, the nutrition worker, the nutrition clinic, malnutrition and the community, malnutrition and tuberculosis, would be convinced of the value of such preventive work. There is need for investigation as to the extent of malnutrition among school children in India.

A TEXT-BOOK OF PRACTICAL THERAPEUTICS
By Herbert Amory Hare, M.D., LL.D., B.Sc.,
18th edition. Published by Henry Kimpton,
263, High Holborn, London

The eighteenth edition of this well-known book has been thoroughly revised and contains much new material. In the second part there is a clear and authoritative account of the pharmacological action and therapeutic uses of most of the newer remedies. The general remedial measures and the feeding of the sick in the third part and the treatment of the diseases in the fourth part have been discussed in the light of recent researches. The new edition of this very practical book is welcome and we warmly recommend it to students and to practitioners.

**AN INDEX OF PROGNOSIS AND END RESULTS
OF TREATMENT**—By various writers. Edited
by A. Rendle Short, M.D., B.S., B.Sc.,
F.R.C.S. John Wright & Sons, Bristol,
3rd edition, 1922, 594 pp 42/- net

The third edition of this well-known volume incorporates war experience of the utmost value, whilst many other sections—such as that on venereal diseases by Colonel L. W. Harrison and that on gynaecology and obstetrics by Dr Eardley Holland—have been entirely re-written and a new section on ophthalmology added by Mr Griffith. Most of the tropical diseases are dealt with by Sir Leonard Rogers, whilst, among many other well-known contributors are Dr Cecil Bosanquet on diabetes, Dr Dudley Buxton on anaesthetics, the late Sir Thomas Storer Clouston on mental diseases, Dr W. Sampson Handley, Dr Arthur Latham—who deals with phthisis and pulmonary affections—Dr Poynton on rheumatic affections, Sir James Purves Stewart, Sir Humphry Rolleston, Dr J. H. Sequeira on skin affections and Mr J. H. Sherren. The volume is thus thoroughly representative of the very best teaching in British medicine, surgery and midwifery.

The whole system of the volume is admirable. In the surgical sections statistics, both for individual operators and for different procedures of technique are given. Thus the surgeon who wishes to know the prognosis in different operations for rectal carcinoma or the end functional results in different types of fractures will find all such information carefully tabulated for reference. Tables giving depreciated capacity for work after fractures and other injuries are a most useful feature of the book.

Of many valuable articles in the volume that on anaesthetics by Dr Dudley Buxton is especially full and instructive, the patient, as a factor, including a consideration of his physical and mental state, the influence of the character of the operation, and post-operative factors are all considered in turn. Appendicitis is very fully dealt with by Mr Hugh Litt. The section on prognosis in diabetes by Dr Cecil Bosanquet will interest all Indian readers. In dealing with gonorrhoea Colonel Harrison emphasises the necessity for attention to details of technique by the physician quite as good results are obtained by simple local measures, such as permanganate irrigation followed by organic silver injections, as by more heroic and drastic measures. Prognosis is largely dependent upon the amount of care and trouble taken in treatment. The chapter on mental diseases by the late Sir Thomas S. Clouston occupies 38 pages and is a full and very authoritative statement in a very confused and difficult field. The discussion on end results in supra-public versus perineal prostatectomy will interest many readers. Dr Latham writes guardedly of the prognosis in pulmonary tuberculosis yet "it is probably true that at least 20 per cent of the cases of pulmonary tuberculosis in which a clinical diagnosis can be made, end in recovery whatever the treatment, and sometimes in spite of treatment" tuberculosis if properly used is of value, it may be of course, and often is, misused. Dr Carey Coombs' article on irregularities of the pulse emphasises the necessity of ascertaining the exact source of origin of the arrhythmia. Surgical affections of the stomach by Mr James Sherren is an article which every surgeon should consult "at the present time chronic gastric ulcer is the most important and the only known factor in the 'causation' of carcinoma of the stomach." The section on syphilis is by Colonel Harrison and deals, *inter alia* with such important questions as prospects as to future disability from recurrence, risks of transmission and of treatment, and syphilis as a problem in life insurance work. In tetanus Dr Rendle Short reviews the war experience, and a case mortality rate which began at 58 per cent in 1914-15, but dropped steadily to a figure of 16 per cent in 1917. The carbolic acid and magnesium sulphate methods proved almost useless in the war. Dr Goodall's statistics in typhoid fever will interest all readers in India. Of 1,828 consecutive cases in the Brisbane General Hospital treated by expectant methods 148 per cent died but of 1,902 subsequent consecutive cases treated by cold or tepid baths only 7.5 per cent died. The case for inoculation as a preventive of enteric is still unsettled, but there appears to be definite evidence that enteric fever is a far less fatal disease in the inoculated than in the non-inoculated person.

If the main interest of any given case lies for the physician and surgeon in accurate diagnosis and appropriate treatment, from the patient's point of view prognosis is the most important feature. Yet prognosis is a matter upon which medical and surgical volumes in general are apt to be discreetly silent. This admirable, well bound and well known manual should be in the hands of every practising physician and surgeon.

THE MECHANISM OF LIFE—By James Johnstone, D.Sc. Published by Edward Arnold & Co., 1921

This is a very interesting book dealing, as its name implies, with the mechanism of life. Life is not simply a structure, it is something "happening" in a structure. It manifests itself by conservation and dissipation of energy. An animal is an "integration of activities." Though the greater part of the book is necessarily a summary of the main results of physiology, the aid of physics, chemistry, biology, and comparative anatomy has been profitably invoked. The author's scrutiny of the various conceptions of life, both modern and mediæval, is excellent. The author is a man of culture and of scientific eminence and we are sure that the general student of social science and culture will find ample readable and instructive matter in this little book.

Correspondence.

To the Editor of THE INDIAN MEDICAL GAZETTE

DEAR SIR—We have read with great interest the admirable review of the recent work on Therapeutics of the Cinchona Alkaloids, which appeared in your issue of November 1922, Vol LVII, No 11, by Major R. N. Chopra

The subject is of such paramount importance that this article is sure to be read and quoted as a valuable review of the present position, and we, therefore, think that the earliest opportunity should be taken for correcting one or two obvious errors that have crept in or have been taken from erroneous statements in former articles on the subject

In the introductory section page 401, the author states that "*C. calisaya* var *ledgeriana* contains 6 per cent of alkaloid, and in exceptional cases, 10 per cent to 12 per cent. In past years we have analysed many thousand samples of this bark in our laboratories, representing some of the very best products of the Java plantations, and the highest test we have ever recorded just reached 9 per cent Quinine Alkaloid, or 12 per cent if expressed as Quinine Sulphate. We think, therefore, that the figure 10 per cent to 12 per cent must refer to Sulphate, and not Alkaloid, content

The author continues "*C. succirubra* (Red Bark) yields 5 per cent of total Alkaloids, of which 2 per cent is Quinine." This we agree, and think it is a fair description of the average *succirubra* that appears on the market, but a few lines further on appears the statement "*C. succirubra* gives a high yield of total Alkaloid 10 per cent, but the Quinidine and Cinchonine contents predominate over that of Quinine"

These two statements are mutually contradictory, and this last remark can only lead the reader to expect to find a minimum of 3 per cent or 4 per cent, and possibly more, of Quinidine and Cinchonine in *succirubra* Bark

We therefore, refer to the typical analysis of Indian Government Bark given by Hooper in the current edition of "Allen's Commercial Analysis" Vol VI Page 48 for *C. succirubra* Root Bark (consequently containing the greatest proportion of Quinidine compared with Bark from Twig, Stem or Branch) —

	Per cent
Quinine	1.24
Cinchonidine	1.43
Cinchonine	0.77
Quinidine	0.41
Amorphous	1.27
Making the total Alkaloid content	5.12

We have seen statements repeatedly made in similar articles in the past few years, which, in our opinion, greatly overstate the amount of Quinidine present in the Bark, and consequently give a quite erroneous impression of the amount available if required for therapeutic use

The analysis of Febrifuge given by MacGilchrist, and quoted on page 402 of your November issue is obviously not the proportions in which the Alkaloids occur in Bark but the proportions in which they may exist in a febrifuge consisting of residual Alkaloids after the removal of nearly all the Quinine and Cinchonidine

To illustrate this point, we have put down in the table below certain comparative figures —

Column I is the analysis quoted by Hooper mentioned above

II the estimated residual Alkaloid remaining after removing 80 per cent of the Quinine and 60 per cent of the Cinchonidine

III the same figures expressed as percentage of total Alkaloid

IV MacGilchrist's Febrifuge

V the same figures after adjusting the percentage to compare with Column III (i.e., after eliminating moisture, ash, etc.)

	I Analysis of <i>C. succirubra</i> (Root) given by Hooper	II Proportion of Residual Alkaloid on Hooper's Analysis	III The same expressed as percentage composition	IV MacGilchrist's Febrifuge Analysis	V The same after adjustment to compare with Column III
Quinine Alkaloid	1.24	0.25	7.64	7.40	8.93
Cinchonidine Alkaloid	1.43	0.57	17.43	5.84	7.03
Cinchonine Alkaloid	0.77	0.77	25.55	16.58	20.02
Quinidine Alkaloid	0.41	0.41	12.54	23.83	28.81
Amorphous Alkaloid, (ash etc) moisture	1.27	1.27	38.84	29.12 (16.12)	35.21
TOTAL ALKALOID	5.12	3.27	100.00	82.77	100.00

It will be observed that there is a certain resemblance between Columns III and V which is close enough to prove that MacGilchrist's formula can only be obtained from residual Bark extract, from which at least 80 per cent of the Quinine and 60 per cent of the Cinchonidine have been removed by crystallisation prior to the precipitation of the remaining Alkaloids for Febrifuge

The Quinidine figure given by MacGilchrist seems to us to be abnormally high, and we are of opinion that this analysis represents a residuum particularly rich in this Alkaloid, and not the normal extract from average *succirubra* Bark

We wish most strongly to emphasise the fact that the available supply of Quinidine has been repeatedly overestimated in various Journals in the past few years, and since greatly increased therapeutic value is now assigned to it, it is fully time that the actual possibilities of its production on an increased commercial scale should be faced

We remain,
Yours faithfully,
HOWARDS & SONS, LTD
ILFORD,
18th December 1922
(Sd) BERNARD F. HOWARD
Director

Service Notes

APPOINTMENTS AND TRANSFERS

THE Governor with the concurrence of the Minister has been pleased to appoint Captain B. Shah, I.M.S., to act as Civil Surgeon, Ahmednagar, in addition to his military duties, with effect from the afternoon of 25th October 1922 until relieved by Lieutenant-Colonel H. A. Knapp, I.M.S.

ON transfer to the Punjab Captain C. J. Lodge Patch, I.M.S., was placed on general duty in the Punjab Lunatic Asylum Lahore from 6th to 12th November 1922

CAPTAIN C. J. LODGE PATCH, I.M.S., assumed charge of the office of Superintendent, Punjab Lunatic Asylum, Lahore, on the forenoon of the 13th November 1922, relieving Major H. V. W. Cox, I.M.D. transferred

ON being relieved of the duties of Professor of Pathology, King Edward Medical College, Lahore, Major W. L. Forsyth, I.M.S., was placed on general duty in the Medical College, with effect from the 23rd October 1922 up to the afternoon of the 25th November 1922

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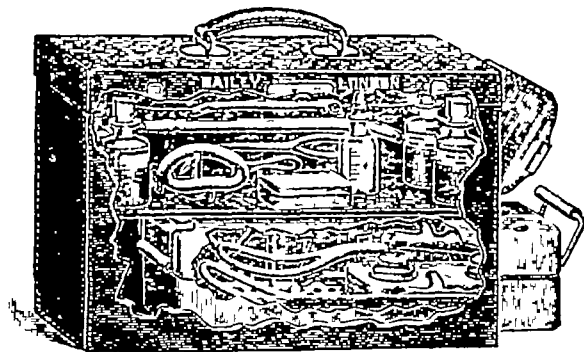
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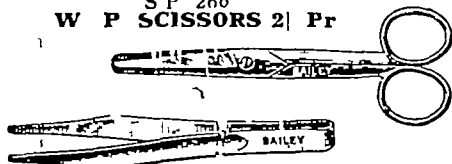
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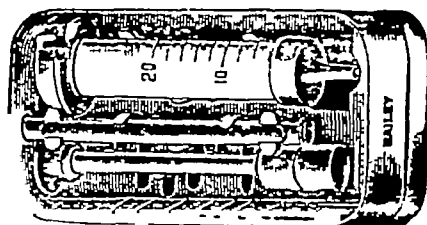
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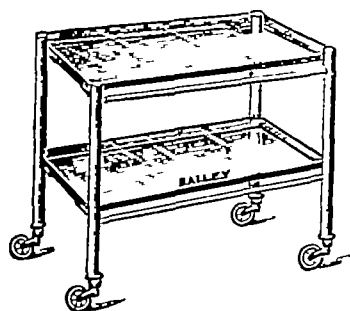
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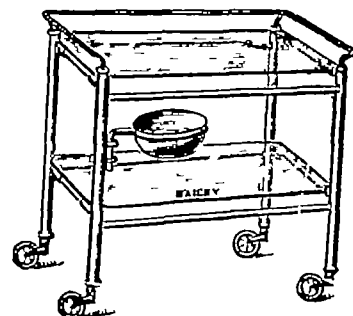
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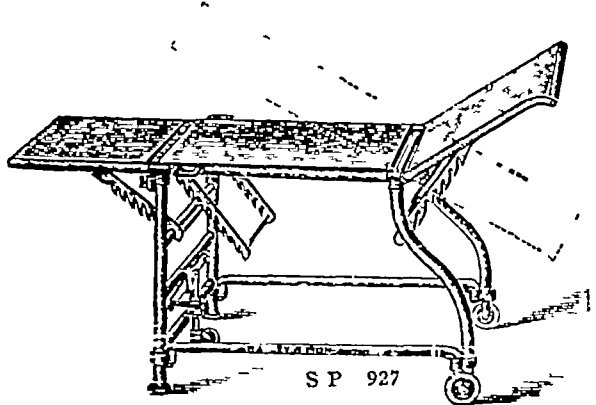
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Theatre or Ward Table

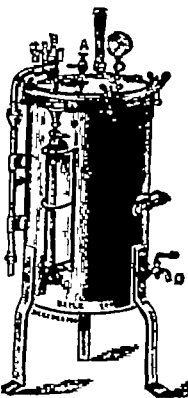
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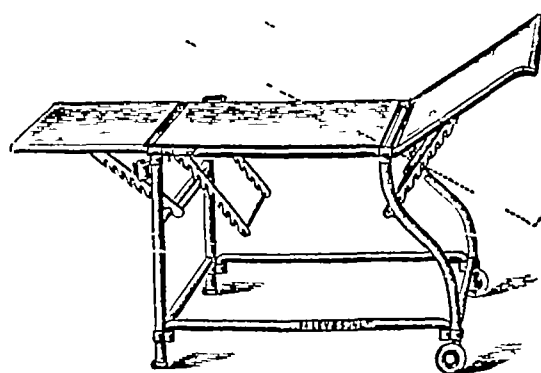
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LONDON, W. 1

THE services of Major W. L. Forsyth, M.S., are placed at the disposal of the Government of India Department of Education and Health, with effect from the afternoon of the 25th November 1922.

CAPTAIN I. A. P. ANDERSON, M.S., an officer of the Medical Research Department is attached to the Central Research Institute, Kasauli, as a supernumerary officer, with effect from the 13th November 1922 and until further orders.

COLONEL R. C. MACWATT, C.B.E., M.B. FRCS, M.S., Inspector-General of Civil Hospitals, Punjab, is appointed to be Director-General, Indian Medical Service in succession to Major-General Sir William Edwards, K.C.I.E., C.B. CMG K.H.P., M.S., with effect from the 8th January 1923, or the subsequent date on which he assumes charge of his duties.

COLONEL R. HEARD, M.D., M.S., is appointed to be Inspector-General of Civil Hospitals, Punjab with effect from the 21st November 1922, until further orders.

LIEUTENANT-COLONEL C. L. DUNN, M.S., Director of Public Health, United Provinces, to be a member of the State Board of Medical Examinations, United Provinces. Major W. A. Mearns, M.S., resigned.

A modification of this Department Notification No. 725, dated the 22nd November 1922. Lieutenant-Colonel H. Halliday, M.B., M.S., Civil Surgeon, Simla (West) is granted leave on average pay for three months, with effect from the afternoon of the 18th November 1922.

OFFICIATING Civil Surgeon Rai Bahadur Tripura Charan Guha made over charge of the Motihari Jail to Major C. G. Howlett, M.S., in the afternoon of the 20th December 1922.

Civil Surgeon Rai Bahadur Barada Kanta Ray made over charge of the Purnia Jail to Major A. S. M. Peebles, M.S., in the forenoon of the 5th January 1923.

LEAVE.

LIEUTENANT-COLONEL T. S. NOVIS, M.S., has been granted by His Majesty's Secretary of State for India extension by one month on average pay on medical certificate of the leave sanctioned in Government Notification No. S. 20 (10), dated the 8th May 1922.

EXTRACTS FROM GOVERNMENT ORDERS ETC.

WITH the approval of His Majesty's Secretary of State for India the Punjab Government (Ministry of Education) is pleased to sanction a revised consolidated scale of pay of Rs. 850-40-1,050-50-1,250 per mensem for officers of the Indian Medical Department when holding charge of the Punjab Lunatic Asylum subject to the condition that they will not draw less than their pay of rank plus Rs. 250 per mensem. The new scale will have effect from 8th October 1922.

No. 612-A, dated Simla, the 14th September 1922
Resolution by—The Government of India, Finance Department.

Accounts and Finance—Allowances, etc.

IN view of the very material rise in the cost of passages, the Government of India have had under their consideration, for some time past, the question of granting assistance to Government servants of non-Asiatic domicile, to enable them to purchase passages for themselves and their families. They have come to the conclusion that the most convenient way in which such assistance can be given at present is by granting advances recoverable in suitable instalments and have decided to sanction the scheme set forth in the annexure, which will take effect immediately.

ANNEXURE.

Rules regulating the grant of advances to pay for the passages overseas of certain Government servants of non-Asiatic domicile and their families
Applicable to—

Officers of the Indian Medical Service in Civil employ
Imperial Branch of the Civil Veterinary Department

Military Commissioned Officers in civil employ and Government servants holding posts borne on the cadres of the above services.

An advance may be made to a Government servant proceeding on leave out of India for the cost of passage by sea from port in India to a port outside Asia for himself and members of his family and also for the cost of the return voyage.

The amount of each advance shall not exceed four months pay of the Government servant or Rs. 6,000, whichever is less, subject to the further condition that it shall not exceed the amount actually required at the time for the purpose for which it is granted. It should be a sum expressed in whole rupees, being a multiple of thirty-six.

When an advance has previously been sanctioned, the amount of a further advance should be so regulated that the total amount outstanding will not exceed the limits mentioned in rule 4. For the purpose of recoveries each advance shall be treated separately.

The sanctioning authority will be the Department of the Government of India, or other subordinate authority to whom the power may be delegated with the consent of the Finance Department, or the Local Government under whose administrative control the Government servant is serving.

If the family proceeds out of or returns to India unaccompanied by the Government servant, separate advances may be made for their passages in both directions, but no advance will be admissible under this rule for a member of the family in respect of whom an advance has previously been made unless the Government servant himself has proceeded out of India on leave since that advance was made. In making application for an advance under this rule, the Government servant should certify that the conditions of the rule are satisfied.

An advance will not be admissible to a Government servant who does not intend returning to civil duty on the expiry of the leave, and the Government servant shall submit with his application for the advance a certificate that he intends to return to civil duty on the expiry of the leave. The applicant should at the same time state whether he has taken or intends applying for, an advance for the same purpose under the rules regulating the General Provident Fund or any other similar provident fund rules.

(a) Advances will be recovered in thirty-six equal monthly instalments by compulsory deductions from pay, commencing from the first payment of a full month's pay after the advance is granted. Except as provided in clause (b) of this rule, no recovery will be made from a Government servant while he is on leave. A borrower may, however, make repayment in less than thirty-six instalments or may repay two or more instalments at the same time.

(b) If the Government servant retires, or applies for and receives permission to retire on the expiry of his leave, the outstanding balance of the advance will be recoverable at once, but where undue hardship is likely to result from compelling payment in one instalment, a department of the Government of India or the High Commissioner for India may permit a relaxation of this rule to the extent of allowing monthly recoveries to be made from the pension or leave salary admissible to the Government servant at a rate not less than half the monthly amount of such pension or leave salary. In applying this rule consideration should be given to the amount which will be handed over to a provident fund subscriber on his retirement.

(c) The borrower will submit to the audit officer concerned within three weeks of the receipt of the advance receipts showing the amount of payments made for passages. In the event of failure to comply with this rule, the amount advanced shall be recoverable at once. If the receipts produced are for an amount less than that advanced, the balance shall be recoverable at once.

Subject to the conditions of these rules, the High Commissioner may sanction an advance to a Government

servant on leave drawing his leave salary in London for the cost of return passages to India of the Government servant and his family, provided no advance for the same journey has been previously made.

A Government servant receiving an advance under these rules will, on receipt of the advance, sign and deposit with Government an undertaking in the form shown in the Appendix to these rules

NOTICE.

WRIGHT'S COAL TAR PRODUCTS

MESSRS LIPTON, LTD, Calcutta Branch, ask us to bring to the notice of the profession in India the fact that they are the Indian agents for Messrs Wright, Layman and Umney, Ltd, and for their coal tar products. Liquor carbonis detergens was first introduced by W V Wright in 1862 and is to-day perhaps the most widely prescribed local antiseptic in skin affections. The original coal tar soap was a combination of coal tar with the ordinary soap basis then in general vogue, but later purified liquor carbonis detergens was used with a neutral triple milled base, whilst antiseptic volatile oils, such as carvacrol, thymol and cinnamic aldehyde were incorporated. The well known coal tar soap of to-day contains the equivalent of 15 per cent of phenol, combined in such a form as to be absolutely non-irritant, and pre-eminently suitable for tropical climates and for the most delicate skins. The soap is claimed to have an excellent effect in tinea cruris and in most tropical cutaneous affections.

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DIMOL

RECENT reports on tests with Capt. Ainslie Walker's newly introduced intestinal antiseptic "Dimol"—(dimethylmethoxyphenol in combination with tri- and tetra-methylphenols)—indicate the definite usefulness of the preparation. It is now in use in several maternity hospitals as an intestinal antiseptic in eclampsia and the pre-eclamptic state a bacteriological report from Edinburgh University confirms the claims made for its bacteria-reducing properties, and one from Guy's Hospital notes a striking reduction in faecal streptococci after its use. In Malaya Dr L. Wheeler reports on

its use in intestinal diseases of different types, and in tropical diarrhoea and dysenteries of different types especially in large scale work on "coolies coming into hospital with a HB index of 20 to 40 per cent, waterlogged and with tissues saturated with toxins absorbed from the gut." In Calcutta recently the preparation appeared to have a most beneficial effect when tried in a case of intestinal tuberculosis, whilst a recent report from Hankow records its apparent usefulness in intractable cases of sprue. The attention of the proprietors having been called to the apparently high cost at which "Dimol" was being retailed on the Calcutta market, action has been taken, we understand, to reduce and standardise prices and in lesions of intestinal origin generally and in the very prevalent chronic intestinal diarrhoeas, dysenteries and toxæmias of India it would be of interest to receive reports as to experiences—especially clinical experiences controlled by bacteriological observations and counts—with the drug.

Notice.

SCIENTIFIC Articles and Notes of interest to the profession in India are solicited. Contributors of Original Articles will receive 25 Reprints *gratis*, if required.

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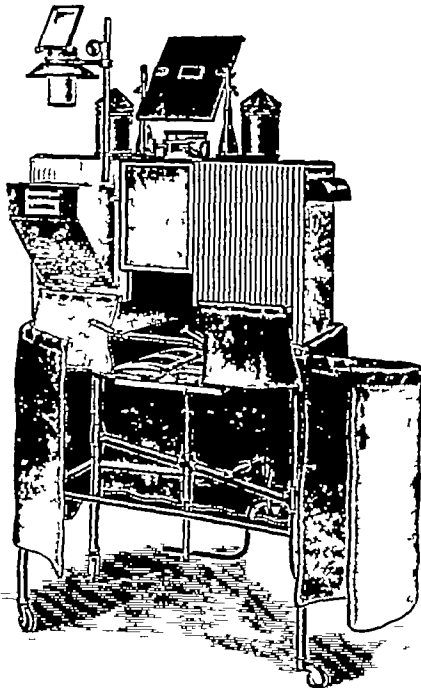
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Original Articles.

THE BERIBERI AND EPIDEMIC DROPSY PROBLEM

By J W D MEGAW,

LT-COL, I M S

PART I

IN considering the problem of beriberi and epidemic dropsy, the discussion can best be kept on orderly lines by dealing with three questions —

- (i) Is epidemic dropsy a form of beriberi?
- (ii) Is avian polyneuritis the same disease as beriberi?
- (iii) What is the probable cause of beriberi?

The first and second of these questions will be dealt with in Part I of this paper, the third will be discussed in the next number of the Gazette

IS EPIDEMIC DROPSY A FORM OF BERIBERI?

A necessary preliminary to an attempt to answer this question is a clear understanding of what beriberi is

The word beriberi is an old one which has been used for many years as a label for cases of disease which show certain symptoms and epidemiological features. It is only in recent years that attempts have been made to attach a definite scientific meaning to the word

The present view of beriberi may be taken to be that expressed in Stitt's excellent little book on tropical diseases, in this we find this statement, "Beriberi is a food deficiency disease due to the absence of a neuritis-preventing vitamin." This is an admirably clear and simple definition, and if we could accept the vitamin hypothesis as explaining all the known facts in connection with beriberi, there would be no need for further discussion of the subject. If, on the other hand, we find that the known facts in connection with beriberi are not explainable on the vitamin deficiency view, we must discard the definition in spite of its attractiveness, and fall back on the unsatisfactory makeshift use of the word beriberi to signify certain disease manifestations

Some points must be clearly stated at the outset one is that there is no test by which we can recognise the existence of beriberi, so that there is no court of appeal at which a final judgment can be obtained as to whether a case is one of beriberi or not

Another is that there is no general agreement as to the boundaries of the disease there are certain outbreaks which every one will agree to call beriberi, but there are others which give rise to sharp differences of opinion, for example "ship beriberi" is regarded by Braddon as being a different disease from "true beriberi," while other authorities regard it as being a form of beriberi, and the same state of affairs exists with regard to epidemic dropsy. It is important

have clear ideas on the subject of the nomenclature of doubtful diseases. If we find that there is a group of disease manifestations which can be distinguished from all other known groups of manifestations, we are justified in applying a special name to that group, but if, on the other hand, we are dealing with a group which merges into an already recognised group in such a way that no dividing line can be drawn between them, it is not justifiable to apply a name which implies that the group is a distinct entity. There is no objection to indicating some special character of each of the members of the group, provided that these characters are designated by sub-headings and not by entirely separate names

In connection with beriberi, there are not only wide differences between the various outbreaks of the disease but also between the individual cases in each outbreak, and it is necessary to view the subject in a broad manner and to take into consideration all the outbreaks and all the cases of each outbreak, instead of confining our attention to isolated well-defined cases and simplifying the subject by ruling out or disqualifying all those outbreaks or cases which do not conform to our preconceived ideas of what the disease ought to be

When we find great variations in the manifestations of a disease, these may be due either to the existence of various causal agents or to differences in the response of the patients to one causal agent. In connection with this point some help may be obtained by a consideration of diseases in which there is a known and definite causal agent. Take, for example, alcoholic poisoning which shows some manifestations like those of beriberi. In this case there is a chemical agency of known composition and yet we find that under certain conditions it produces acute delirium, while under other conditions it causes peripheral neuritis, cirrhosis of the liver and other chronic tissue changes. This example shows that under varying conditions the same agency may produce disease manifestations of very different forms, and so much is this so, that if we did not know the histories of the individual cases of alcoholism, we should never suspect that they all belonged to the same group. We also find in connection with alcoholic poisoning that the extreme types are linked up by intermediate types, and it is reasonable to argue that if the same thing is found to occur in beriberi, we may be dealing with a causal agency which is one and the same, though, of course, we must keep an open mind as to the possibility of more than one agency existing. Every hypothesis must be tested, and until we find one which will explain all the known facts of the disease, we should not be satisfied with it

Another point which is worthy of attention is that those who write descriptions of diseases often tend to be biased by their own personal experience, so that they lay special stress on the symptoms of the cases which they themselves have observed. It is for this reason that different

accounts of the same disease sometimes read like descriptions of totally distinct diseases

The stated differences between Beriberi and Epidemic Dropsy

In a recent article in a Calcutta medical periodical, the differences between these diseases were said to be no less than twenty-nine, and any one who read this list might be forgiven for thinking that there could be no possible relationship between beriberi and epidemic dropsy

Let us look at the more important of these stated differences

I The Geographical Distribution of the Diseases

This point is of special interest. It is stated that beriberi is a disease of Japan, China, Burma, Malaya, Madras, Ceylon, etc., and that it is common in ships, while epidemic dropsy is a disease of Lower Bengal, Assam, Madras and Mauritius. Apart from the fact that a statement like this begs the whole question, it would be a truly remarkable fact if two diseases should partition off the territories of the tropical world. Beriberi is admittedly a disease widespread throughout those parts of the tropics in which rice is the staple article of diet, and it would indeed be strange if it should avoid one limited area of the rice-eating tropical world and should be replaced there by a very similar disease—epidemic dropsy.

The geographical distribution is really strong evidence that there is one disease and not two.

II The Seasonal Distribution

This is very variable in the case of both diseases and depends on certain factors which will not be discussed here, but it is interesting to compare the only analogous large sets of figures at my disposal, the one dealing with the seasonal occurrence of beriberi in Tokio as given in Mense's book on tropical diseases and the other being the figures given by Colonel Greig for the outbreak of epidemic dropsy in Calcutta in 1909.

	Epidemic Dropsy in Calcutta 1909 (Greig)	Beriberi in Tokio (Mense)
January	6	93
February	8	105
March	7	178
April	18	316
May	41	460
June	129	826
July	214	1,335
August	481	1,181
September	289	831
October	199	564
November	90	257
December	46	190

These figures might fairly be used as an argument in favour of the similarity of the two diseases, and such other data as exist show an essential similarity in the seasonal prevalence of the two diseases.

III Epidemiology

This is very similar in the two diseases. Each is liable to occur as large epidemics or as isolated outbreaks in schools, jails, asylums, barracks, or

families, and there is rarely the slightest evidence of any infection from the outside.

Both diseases are obviously associated with certain habits of diet, and there is a remarkable freedom from attack on the part of people who are intimately associated with the sick in every other respect save only in the important matter of diet.

In one classical example of epidemic dropsy, the late Colonel McLeod considered that the disease had been conveyed as an infection to Mauritius and also to Assam by means of the coolies who went from Bengal to work in these places, but it is quite likely that the coolies were accompanied by supplies of the rice which caused the disease and so the ships or trains which carried the coolies may also have carried the offending rice. Just as labour from Bengal was cheaper than that in Mauritius and Assam, so it is probable that rice also was cheaper and that it would be carried by the ships or railways which conveyed the coolies. What looked at first sight like an obvious case of infection may in reality have been something quite different. In almost every instance in which people from Bengal have become affected after going to some other place, it has been found that they took with them a supply of the special kind of rice to which they had been accustomed. It is true that there are a few recorded cases in which the spread of the disease appears to be more easily explained as an infection than as a dietetic disease. These are so few in comparison with the great number of instances in which infection has utterly failed to spread, in spite of the closest association of the patients with other persons in every other respect, excepting only the crucial one of a common diet, that the cases of apparent infection cannot be accepted without the closest scrutiny. When a number of cases of a disease occur in quick succession among members of the same family or of the same community, there is a natural tendency to assume that the disease is being spread by infection, whereas there may be a common cause acting on a number of people at the same time. This point has been very fully discussed by Colonel Greig and others, and there is overwhelming evidence in most cases that the disease is not transmitted from one person to another.

IV Incubation Period

This appears to be short in some cases of epidemic dropsy. In my own experience it has been as short as a week or so, and cases are recorded in which it appears to have been one or two days, but in both diseases the incubation period is very variable. Taguchi recently produced symptoms of beriberi within four days in five human beings who were fed on polished rice, cardiac dilatation appeared on the fifth day in all of them. In both diseases cases with sudden onset and almost instantaneous death from heart failure are well recognised.

The latent period of both diseases corresponds in that it is extremely variable and is long in most

cases, it certainly cannot be regarded as a satisfactory point of distinction between them

I' Gastro-Intestinal Symptoms

These are far more frequent in epidemic dropsy, but on the other hand some of the writers on beriberi lay special stress on the initial gastro-intestinal symptoms which they regard as an important feature of the disease, and in many cases of epidemic dropsy gastro-intestinal symptoms are altogether absent

Ellis in 1898, in the *Lancet* describes the changes in the stomach in beriberi in these words, "The lining membrane of the stomach was congested in 31 out of 57 cases, in most of them intensely congested. In four cases there were blood clots in the stomach, no doubt from the persistent vomiting from which they suffered before death." Wright also describes this congestion and adduces it as an argument in favour of his view that the disease is due to an infection. Taken altogether it would appear that gastro-intestinal irritation may be a marked feature of both diseases

II Rash

This is regarded as a strong point in favour of the diseases being different, but the rash is usually vague and indistinct in epidemic dropsy, and one authority (Miura) who has had great experience of beriberi, says that spotty or diffuse redness of the skin is of frequent occurrence in that disease

The fact that a similar rash may occur in both diseases is really evidence in favour of their being essentially similar in nature. In both it appears to result from a vaso-motor disturbance

III Oedema

The same argument applies to this as to the rash. Oedema is admittedly a striking feature of both diseases, and though it is almost uniformly present in epidemic dropsy and only sometimes present in beriberi, it is also true that in some outbreaks of beriberi it is always present, while in others it is always absent, there being in fact a great degree of variability in the incidence of oedema as well as in most of the manifestations of the disease

VIII Anaesthesia

This is more pronounced in beriberi, but also occurs in a good many cases of epidemic dropsy, it was present in most of the cases seen by me in the 1909 outbreak in Calcutta, but in most of the available reports the evidence on the subject is rather vague and unsatisfactory

IX Knee Jerks

The condition of the knee jerks constitutes one of the most definite means of finding out the degree to which the peripheral nerves are affected, and for this reason it is specially important to examine the recorded facts in connection with the patellar reflexes. In most outbreaks of beriberi loss of the knee jerks is the rule, while in most outbreaks of epidemic dropsy the jerks are present or even exaggerated, so that at first

sight there would appear to be an essential difference between the two diseases

But the apparently wide gap is bridged over if we examine the records, for example, in Colonel Greig's report of the outbreak of epidemic dropsy at Basti Jail the knee jerks were absent in more than half the cases, the same was true of the cases seen by me in the General Hospital in the Calcutta outbreak of 1909, and in the outbreak reported by Anderson. Absence of the knee jerks is by no means an essential feature of beriberi. Scheube says, "The knee jerks are frequently absent in beriberi."

Increase of the knee jerks is a feature of the early stages of beriberi, and in this connection Durham states "The increase may remain and never disappear before the patient's apparent recovery, or it may slowly decrease to absolute loss."

It is therefore obvious that in different outbreaks of beriberi and epidemic dropsy there are great variations in the knee jerks, due to variations in the reaction of the body to the cause of the disease, or in the nature of the causal agency

Special stress has been laid on the knee jerks, as the condition of these is easy to determine and definite records of the jerks are numerous

X Paralysis and Muscular Wasting

These go hand in hand with the knee jerks. While they are much more prominent in beriberi, they are by no means universal in that disease, and on the other hand they are often seen in cases of epidemic dropsy. Braddon, who goes further than most authorities in the restriction of the term beriberi to a well defined group of disease manifestations, says "Although in the combination of the two main symptoms of the disorder, namely dropsy and paralysis, every degree of gradation occurs, yet typical cases of predominance of either exhibit, when regarded as syndromes of symptoms flowing from one and the same essential cause, a contrast so remarkable as to suggest that the difference in effect is attributable less to variability of reaction in the subject than to actual differences in the constitution of the agent itself."

He goes on to point out that these differences are not compatible with the presence of one living agent, but rather with a natural toxic product of variable composition and consequently irregular in its effects

XI Fever

This is a point on which much stress is laid, but the records show that fever is by no means a universal feature of epidemic dropsy, and while one must admit that it may have been overlooked in many cases of epidemic dropsy, it is even more likely to be missed in beriberi because fever is not a recognised symptom of beriberi and therefore is not so carefully looked for as it is in epidemic dropsy. Yet in beriberi fever is regarded by Grimm as one of the most constant

features of the early stages, and it is quite possible that systematic temperature records of the early stages of beriberi would show that slight rises of temperature are common, though less so than in epidemic dropsy

Having dealt in some detail with the supposed differences between beriberi and epidemic dropsy, some of the points of resemblance which have not yet been emphasised may be indicated

Both diseases come like a thief in the night on the communities affected, the cases show every degree of transition, from the suddenly fatal to the extremely chronic. Both are diseases which almost invariably attack people who eat rice as an important part of their diet, the exceptions to this rule being so few that one suspects that they are apparent rather than real. Both diseases yield promptly to the same change of diet, except when they have progressed to a stage at which treatment of any kind is unavailing. So far as one can obtain evidence from the records of outbreaks of epidemic dropsy and beriberi, there does not appear to be any essential point on which one can rely for a differential diagnosis. It is true that if we were to consider only those outbreaks of epidemic dropsy in which fever, gastro-intestinal symptoms and normal or increased knee jerks are constant features and on the other hand those outbreaks of beriberi in which there is no fever, no gastro-intestinal symptoms and in which the knee jerks are always absent, there would be no difficulty in forming two distinct disease groups, but the more evidence we collect the more clear it becomes that these extreme types stand at the ends of a chain of which every link is complete

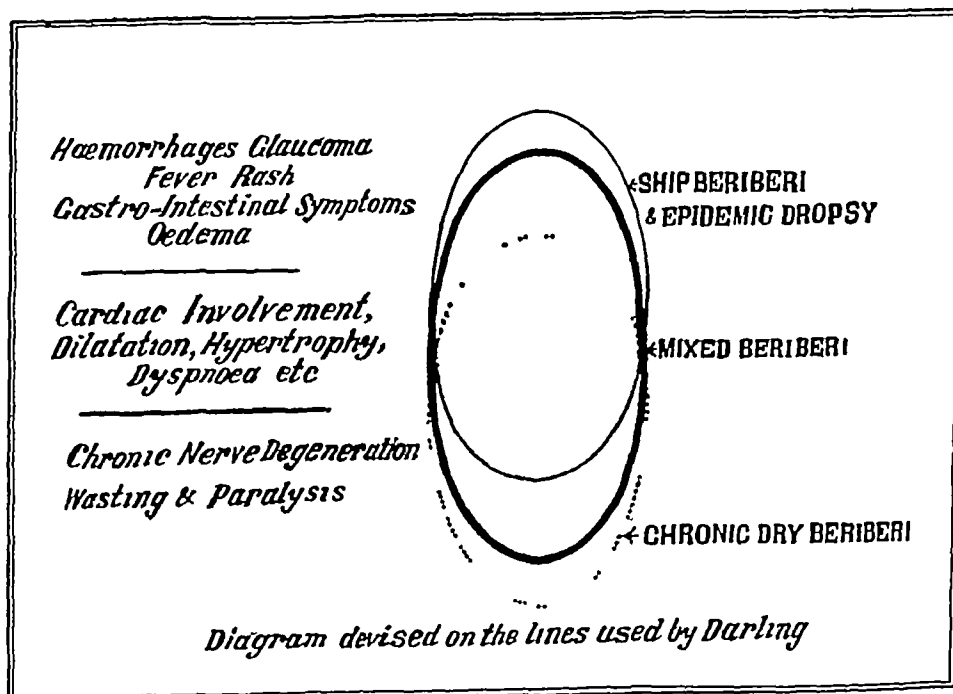
makes no pretence to scientific accuracy, it gives an idea of the manner in which the various types of the disease appear to be related to each other. Cardiac involvement is the central and most essential feature of the disease.

It is to the cardio-vascular system that special attention should be paid, and such easily recorded and well defined points as pulse rate, blood pressure, nitrogen content of the blood and changes in the heart found after death ought to receive special attention in all descriptions of beriberi, for there is reason to think that the condition known as famine œdema and other conditions of malnutrition may have given rise to confusion with beriberi for want of a due consideration of these points*.

In conditions of malnutrition the pulse is usually slow, the heart is depressed, the blood pressure is low and it is likely that the nitrogen content of the blood is lowered, also the heart is found to be atrophied after death, whereas in beriberi and epidemic dropsy the recorded facts point to a rapid pulse, an excited heart, an increase in the nitrogen content of the blood and hypertrophy of the heart.

Differences of type of the most decided character do occur between beriberi and epidemic dropsy, and it may turn out that there are variations in the nature of the causal agency which account for the variations in the symptoms of the disease.

We must admit that the average outbreak of epidemic dropsy, seen in Calcutta, differs in its general clinical aspect from the classical form of beriberi, and those who have seen the cases of beriberi in Chinese patients in Calcutta in which



Perhaps the best way to indicate my view of the relationship of these diseases to each other is to adopt a diagram similar to that which Darling employed to express his view of the relationship between the deficiency diseases. Though this

chronic peripheral neuritis is the chief manifestation will certainly agree that these cases show

* In the latest edition of Manson Bahr's standard book it is stated that epidemic dropsy "is probably the same disease as war œdema".

a very different clinical picture from the average case of epidemic dropsy, and it is only by finding a series of outbreaks which completely fill in the gap that we are forced to the conclusion that the diseases have not yet been shown to be different entities

In Table I are shown the prominent symptoms of certain recorded outbreaks of "beriberi" and "epidemic dropsy"

IS BERIBERI THE SAME DISEASE AS AVIAN POLYNEURITIS ?

It is an article of faith among many medical scientists that these two diseases are the same, and though protests against the acceptance of this belief have been made from time to time, little notice has been taken of them

The line of reasoning which led to their being regarded as the same appears to have been something like this

Both diseases are associated with the eating of rice, especially polished rice. Both diseases can be cured by stopping rice and substituting some other article of diet. In both diseases there is degeneration of the peripheral nerves. If we add to these considerations the fact that medical men had become weary of the succession of different views which were expressed about beriberi, it is perhaps not surprising that they should have accepted a dogma which appeared to be based on experimental evidence and which put an end to the interminable discussions which had taken place for years over the causation of beriberi

It is, however, essential to examine in a critical spirit a doctrine of such far-reaching importance and to see whether it is based on facts

Eijkman himself does not affirm that the diseases have the same cause, though he does not expressly deny it. Shiga and Kusama ask for more proof of their identity. Vedder, who is the greatest advocate of the view, admits that there is a difference in the morbid anatomy but claims that the similar etiology is the crucial point. It is necessary to emphasise this point, for it is too generally assumed that the whole structure of our knowledge of the causation of beriberi depends on the proved identity of the disease with polyneuritis gallinarum. For this reason I lay stress on the fact that Vedder claims that the two diseases are proved to be the same, because they have the same cause, not because they have the same symptomatology. If they cannot be shown to have the same cause, the elaborate structure which has been built on their assumed identity falls to the ground

An essential preliminary to the discussion of avian polyneuritis is a knowledge of the composition and mechanical condition of overmilled polished rice, undermilled rice and parboiled rice, as these are the foods which have been most prominent in the experiments on the subject.

It is not merely in its richness in vitamin B that parboiled rice has an advantage over polished rice, it is also richer in fats and proteins and in phosphorus, and it has a most important mechanical advantage in that its tough outer layer keeps the starchy inner layers protected against external influences owing to this the parboiled rice is less likely to absorb moisture and so does not become a suitable medium for the growth of microbes. The protective layer also prevents microbes from

TABLE II

Composition of Rice
(Greig and Fraser and Stanton, etc.)

	Un polished Rice	Parboiled Rice	Polished Rice	Rice Bran
Vitamin B	+	+	0	+++
Protein	9 %	7.68	6.5	Higher (percentage not stated)
Fats	1.65%	2% to 2.5%	0.25% to 0.5%	22% to 24%
Phosphorus content.	0.54%	0.58%	0.26% to 0.38%	3.2%
Protective outer coat	Present	Present	Absent	

reaching the inner layers which are the ones most likely to be attacked by them. There is thus not only an immediate loss of nutritive value due to the overmilling, there is also a susceptibility to further changes not only from atmospheric conditions but also from invasion by microbes. It is likely that polished rice may be a very variable quantity according to age and conditions of storage. Parboiled rice, while it is known to undergo changes by keeping, is less susceptible to these changes, and if they take place, they may be of a different nature owing to the differences in the mechanical condition and composition of the rice. It is too generally assumed that rice is a substance whose composition and properties depend only on the degree to which it has been deprived of its outer coat, changes that may occur afterwards are ignored. A little consideration will show that two specimens of the same brand of rice may have widely different properties. Those who are connoisseurs of rice are well aware of some of these changes, but there may be others of which we are entirely ignorant and which need very thorough investigation

It is quite possible that some of the remarkable discrepancies noted in connection with animal feeding experiments may be accounted for by these changes

TABLE III

Vitamins in various articles of food according to different authorities

Article of Food	McCarrison	Hume and Chick	Poly's Vitamin Manual
Polished Rice	O	O	O
White Flour			
Bread and Biscuit	O	O	+
Fresh Cow's Milk	+	O	+++
Potato	+	O	+++
Fresh Cabbage and Onion	+	+	+++
Butter	O	O	O
Fresh Fish	+	+	
Meat	+	+	
Egg Yolk	++	++	
Oatmeal and Wholemeal Bread	++	++	+++
Dal Peas and Beans	+++	+++	
Wheat Maize Germ and Rice Germ	+++	+++	
Yeast Extract	+++	+++	+++

Turning next to the question of the vitamin B content of the more important other food stuffs, a glance at Table III will show that there is far from being an agreement on the subject, and we find the astonishing fact that, while one observer declares that there is no vitamin B in fresh milk and potatoes, another states that it is present in abundance in both of these foods. It is not surprising that there should be a good deal of confusion of ideas on the subject of this vitamin, when such wide differences of view exist with regard to the amount which is present in important food stuffs like milk and potatoes.

Reading the literature on vitamin B one is left with the impression that there is very little accurate knowledge regarding it, the present tendency is to assume that two accessory food factors are included under the term and the confusion is increasing rather than diminishing. It would appear that the adoption of a precise term like "vitamin B," and the definition of the disease produced by its absence as polyneuritis gallinarum may have given rise to a general suggestion of simplicity and definiteness which is quite unjustified.

In the case of the antiscorbutic vitamin there is something definite to go on, and one can predict with a reasonable degree of certainty that human beings who are fed on a certain diet will get scurvy. We also know with some degree of preciseness what quantity of fresh vegetables or other food rich in the essential vitamin will suffice to prevent the disease but if we take the diets of persons suffering from beriberi, do we find that these are essentially different from those of the rest of humanity, in such a way that the occurrence of beriberi can be predicted with any degree of certainty? It is true that faults can often be found in the diets of people who suffer from beriberi, but are we sure that the diets of

thousands of people who are free from the disease do not suffer from exactly the same faults? It is surprising that the writers on the subject are so easily satisfied with vague statements of the diets being "ill balanced" and "deficient in vitamins." If we take the tables which have been prepared by authorities on the subject, it is obvious that the diets of a large proportion of the human race could be shown to be deficient in this vitamin by a suitable manipulation of the tables. Taking the table of Hume and Chick, one would expect that every young animal would suffer from polyneuritis from its earliest years, as we have the astonishing statement that fresh milk is lacking in the essential vitamin. It is also clear that many inhabitants of cold climates whose diet is almost entirely made up of white bread and butter and jam have a diet which is far more deficient in vitamin B than the diet of most of the people who suffer from beriberi.

The changes which take place in the body of animals suffering from avitaminosis resulting from a diet deficient in vitamin B have been tabulated by McCarrison in his valuable work on deficiency diseases, and it is desirable to compare these changes with those observed in human beings who have died of beriberi.

The summary of the facts contained in this table is of first class importance. It appears that in the deficiency disease of fowls and monkeys the heart is atrophied, while it is always hypertrophied in human beriberi. The same holds good with regard to the spleen. The tissues of the body are oedematous in beriberi and rarely so in deficiency polyneuritis. In a few exceptional experiments by other workers on monkeys fed on white rice, cardiac hypertrophy and oedema were produced instead of the usual atrophy seen in the vast majority of animals, including monkeys. It is quite possible that these exceptional cases have been examples of beriberi due to the same cause as gives rise to the disease in human beings. McCarrison is by no means satisfied that deficiency in diet can account for the symptoms of beriberi in all cases, and he falls back on the view that a co-existent intestinal infection is a factor in many cases, but in his experimental animals, even the addition of an intestinal infection does not produce hypertrophy of the heart nor does it produce oedema of the tissues.

Altogether the post-mortem findings in the two diseases are so different that they constitute *prima facie* evidence against the identity of the conditions. While it is admitted that experimental animals often show responses to disease agencies which are different from those shown by human beings, it must be evident that in this case we are dealing with differences of first class importance and the onus of proof that the diseases are the same must rest on those who claim their identity. It has not even been shown that the nerve changes are the same. Hofmeister has recently pointed out that rats suffering from deficiency of vitamin B show changes in the

TABLE IV
Changes found after death in beriberi and avitaminosis
 (Abstracted from McCarrison's Table)

Organs	Polyneuritis columbarum	Human beriberi	Polyneuritis columbarum with coexistent infection
Heart	Atrophy dilatation of right heart common	Hypertrophy heart 50 per cent. heavier than normal in average Dilatation of right heart frequent.	Atrophy dilated right heart
Spleen	Atrophy pronounced	Hypertrophy	Often enlarged
Adrenals	Marked enlargement	Enlargement (Sprawson)	Enlargement
Liver	Slight atrophy often hyperæmia	Enlarged, often hyperæmia Rarely congested (Ellis)	Enlarged and very congested
Duodenum and Intestine	Hyperæmia and ecchymosis	Hyperæmia and ecchymosis	Hyperæmia and ecchymosis
Lungs	Œdema rare	Œdema common	Œdema rare
Kidneys	Slight atrophy	Enlarged and congested as a rule.	Enlarged and congested as a rule
Ascites	Rare	Common, 50 per cent (Scheube)	Rare
Hydropericardium	Common 13—75 per cent.	Very common, 50—98 per cent	8.3 per cent
Stomach	Atrophy.	Congestion in 54 per cent (Ellis) Hyperæmia, ecchymosis, erosions (Miura)	Frequent congestion
Brain	Hyperæmia or anæmia or normal No œdema	Hyperæmia and œdema	Hyperæmia
Skin	Probably thinner	Œdema ecchymoses have been reported	Dark coloured
Subcutaneous Tissues	Œdema rare, fat disappears	Œdema in 55 per cent (Scheube)	Œdema rare
Muscles	Great atrophy, rarely œdema	Atrophy œdema	Dark coloured

central nervous system to which the changes in the peripheral nerves are secondary, and he regards these changes as comparable to those sometimes seen in chronic alcoholic poisoning. It is also well known that peripheral nerve degeneration both in fowls and human beings may occur as a result of various causes, such as avitaminosis, chemical intoxication, bacterial intoxication, etc., and it is not safe to conclude from such slender grounds as nerve degeneration that the two diseases are the same.

SUMMARY

In this part of the paper a few facts have been collected which show that—

I Polished rice does not differ from parboiled and undermilled rice merely in being deficient in vitamin B. It is also deficient in fats and phosphorus and proteids, and conclusions drawn from feeding experiments must take into account all the defects in polished rice.

II Rice, and especially polished rice, is not a stable article, it is likely to undergo important changes during the period of storage. These changes appear to have been ignored in most of the animal experiments which have been carried out hitherto.

III The changes in the tissues of animals which have died of avitaminosis are by no means the same as those seen in human beings who have died of beriberi. These differences have not yet been accounted for.

IV In view of these circumstances it is not safe to conclude that human beriberi is the same as animal avitaminosis.

V Human experiments and human experiences must be considered and unless these are found to be in keeping with the results obtained in animal experiments, it is likely that there is some fallacy, such as has been suggested above.

In the next part of the paper human beriberi, including the epidemic dropsy form, will be discussed briefly.

A PRELIMINARY NOTE ON THE RELATIONSHIP OF THE INTESTINAL PROTOZOA OF MAN TO THE HYDROGEN ION CONCENTRATION OF THEIR ENVIRONMENT

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(A paper read at the Indian Science Congress, Lucknow, January, 1923)

It was pointed out to the writers by Major H. W. Acton, I.M.S., that in amœbic dysentery the stool is usually acid to litmus, whereas in bacillary dysentery the stools are usually alkaline. It occurred to us, therefore, in view of the introduction of recent and more modern methods of estimating the hydrogen ion concentration of fluids, that it might be of interest to study the pH of the

faecal environment in which the different intestinal protozoa of man are found in the stool. This enquiry was only commenced on the 12th of September 1922 the results here reported are merely of a preliminary character and are reported only because they raise questions of possible interest in connection with amœbiasis and *Entamoeba histolytica*.

Technique

The stools examined were all received during the course of routine laboratory work. They were examined as soon as received from the hospital (a) in saline and (b) in iodine emulsion. Wherever any doubtful forms were seen, hæmalum films after osmo-chromic fixation and very frequently carefully prepared iron-hæmatoxylin preparations after Schaudinn fixation were studied. The fresh preparations having been examined, 5 c.c. of the stool (if fluid) was placed in a collodion sac and dialysed against 15 c.c. of cold boiled saline almost free from CO₂*. If the stool was formed or semi-formed, it was ground up into an emulsion with a minimum amount of the same saline. After an hour's dialysing the dialysate was tested by one of us (L. E. N.) by the colorimetric method described by him in another paper, submitted for publication elsewhere.

Possible sources of fallacy in such a method cannot, of course, be ignored. The pH readings may be taken as accurate, and are all by the same observer, who was ignorant of what protozoa the stool contained at the time of doing the titration. The possibility of absorption of CO₂ from the air by or loss of CO₂ to the air from the stool on keeping cannot, however, be ignored. Most of

* The saline was boiled vigorously for five minutes and then cooled. Its pH, on several tests, was always about 6.8.

the stools examined had been passed from 1 to 2 hours previously, whilst the pH observation was made 1 to 1½ hours later. Here we found that keeping the stool or even the dialysed emulsion in the ice room overnight markedly changed the pH. On the other hand, a stool which shewed a pH of 5.44 was left on the laboratory bench till 2 p.m.—uncovered—and still shewed a pH of 5.44 after three hours' keeping. This point, however, demands further investigation. The volume of the dialysate does not seem to matter much. 1 volume of emulsion from a given stool was dialysed against 1 volume and 2 volumes of both saline and of distilled water free from CO₂ and all four readings gave the same pH of 8.14.

For tissues the method adopted was to mince them finely and emulsify in CO₂—free saline. Where the pH of the colon mucosa was tested, it was washed free of faeces, turned inside out and suspended in saline inside the collodion sac.

Results

The results obtained, up to the 15th December 1922, are shewn in Table I. In general it may be said that in purely amœbic dysentery, where the passed stool is full of active, motile, vegetative *E. histolytica*, the pH range is very limited and is usually about 6.22. On the other hand, in bacillary dysentery, where the stool is alkaline and when intestinal flagellate protozoa are often present in considerable numbers, the pH is much more alkaline, and ranges from 7.5 to 8, or even higher, and motile vegetative flagellates are usually found only when the pH is high, e.g., *Trichomonas* at 7.84 and *Chilomastix* at 7.40. As the case of amœbic dysentery recovers, however, and as the stools become formed and the dysentery ceases, *E. histolytica* cysts are found at a pH on the alkaline side, 7.17. Still later, when the finding of

TABLE I
The pH Environment of the Human Intestinal Protozoa, etc

Organism and State	No. of Observations	Extremes of pH range	Mean pH
<i>Entamoeba histolytica</i> —			
1 Vegetative and motile	5	5.44 to 6.70	6.22
2 Vegetative but non motile (dead)	6	6.07 to 8.26	7.32
3 Pre cystic (only)	1		7.27
4 Encysted 1–4 nucleate	9	6.07 to 8.34	7.17
<i>Entamoeba coli</i> , —			
1 Vegetative	5	5.86 to 7.38	6.79
2 Pre cystic (only)	2	7.38 to 8.26	8.32
3 Encysted 1–8 nucleate	10	6.47 to 8.34	7.38
<i>Endolimax nana</i> —			
1 Vegetative	5	5.26 to 8.28	7.18
2 Encysted 1–4 nucleate	6	5.26 to 8.26	7.03
<i>Giardia intestinalis</i> —			
1 Vegetative but non motile (dead)	5	4.00 to 8.28	6.09
2 Encysted	20	4.00 to 8.28	6.65
<i>Trichomonas intestinalis</i> —			
1 Vegetative, motile	4	7.38 to 8.34	7.84
2 Vegetative, dying, "amœboid"	1		5.81
<i>Chilomastix mesnili</i> —			
1 Vegetative, motile	5	6.86 to 8.04	7.40
2 Encysted	4	6.60 to 8.26	7.43
<i>Enteromonas hominis</i> , motile and encysted	1		8.26
<i>Spirochaetes</i>	6	4.32 to 6.60	5.78
<i>Yeasts</i>	18	4.40 to 8.34	6.80
<i>Blastocystis hominis</i>	19	5.75 to 8.34	7.13
<i>Charcot-Leyden crystals</i>	15	6.48 to 8.40	7.36

Charcot-Leyden crystals constitutes the only evidence of past amœbic dysentery,—for as shewn by Acton (1919) the finding of Charcot-Leyden crystals in the fæces is almost pathognomonic of infection with *E. histolytica*,—the pH is still more alkaline, 7.36

It would almost seem, then, as if one of the factors in causing *E. histolytica* to encyst, as it passes out of the mucosa into the lumen of the gut, may be an increased alkalinity of its pH environment. On the other hand, sudden alterations to an alkaline pH, e.g., the administration of saline aperients, may kill the organism in its vegetative stage. Six observations with a wide pH range for dead *E. histolytica* and a mean of 7.32. Further, the entirely different pH of the stool in acute amœbic and acute bacillary dysenteries suggests that such a term as "mixed dysentery" is, in reality, inaccurate. That "mixed dysentery," associated with a rapidly changing pH of the colon contents, is really a transitional phase,—*E. histolytica* infection setting in in a colon wall already ulcerated by Shiga or Flexner dysentery, or a superinfection by Shiga or Flexner bacilli of a gut wall already ulcerated by *E. histolytica*, the one infection being in process of changing to the other.

Experiments on Kittens

During the past ten months two of us (R. K. and B. M. D. G.) have been especially studying experimental amœbic dysentery in kittens. To infect a kitten per rectum is simplicity itself. A perfectly fresh amœbic stool, full of actively motile *E. histolytica*, is taken and a thick emulsion made in saline. A 20 c.c. Roux syringe is filled with the emulsion and a soft rubber catheter is tied on to it, in place of the usual hypodermic needle. The catheter is passed up at least 6 to 7 inches into the colon, the kitten being held upside down, and the contents of the syringe slowly injected. In from 3 to 7 days' time the kitten contracts amœbic dysentery and its stools are full of motile *E. histolytica*. The chief symptom, however, is not dysentery or tenesmus, but emaciation. We have found this method of Dale and Dobell's a far more reliable one than feeding kittens upon cysts. We have succeeded on five successive occasions within the last 8 months in experimentally establishing amœbic dysentery in kittens and 14 animals have given positive results. The method practically never fails to produce fatal amœbic dysentery in kittens though adult cats are far less susceptible. One experimental kitten deserves special mention. This kitten died in a state of extreme emaciation on the 12th day after rectal injection. It had never shewn any symptom of dysentery. On post-mortem examination the colon was found to be perfectly healthy, but the cæcum was severely ulcerated, and mucus from the cæcum was full of motile, vegetative *E. histolytica* in its most destructive phase.

It is only since the 16th September that we have studied the pH in infected kittens. Full experimental details and findings in the six sub-

sequent experimental kittens are shewn in Table II. Unfortunately the work has been rendered exceptionally difficult by want of proper animal accommodation at the School. It will be seen that whereas the experimental strain successfully established in kitten No. I, was successfully passed to No. II, on passage to No. III, it was wiped out by naturally acquired coccidiosis, the pH of the passed stool becoming very acid, 4.4. Kitten No. IV was successfully infected on the 5th day, but coccidiosis set in and threatened to stamp out the amœbic infection. In No. V, the infection failed to take owing to coccidiosis, whilst No. VI also shewed coccidiosis, and recently our reserve, uninoculated kittens have commenced to die from the epidemic. It is obvious that, in India at least, the fæces of kittens used for experimental dysentery must be carefully examined beforehand for possible coccidiosis.

Scanty and only preliminary as these results are, however, they include some interesting findings. Motile, vegetative *E. histolytica* with ingested red blood corpuscles was found in either the perfectly fresh stool twice at pH readings of 6.20 and 6.47 and in the fresh colon contents at pH readings of 6.47, 6.20, 6.47, 5.56, 6.14 and 6.36. In other words at an average pH reading of 6.20. The pH readings for the colon and rectum, either by turning them inside out and soaking in saline, or minced up in saline were 6.24, 6.24, 6.14, 6.60, 6.44, with an average pH of 6.33. The pH of kittens' livers was found to be 6.14, 6.17, 6.48 and 6.57 respectively, or an average reading of 6.34. A pH environment which would appear to be thus especially suitable for the motile, vegetative, and destructive phase of *E. histolytica*. At present no opportunity for the determination of the pH of fresh human liver has presented itself.

Conclusions

It is obvious that much further work along these lines is indicated. The pH environment in which *E. histolytica* finds itself in the mucosa of the colon wall may perhaps play an important part in its pathogenicity or otherwise. With regard to prognosis we find that when the stool is examined daily, a rising pH usually goes with satisfactory progress on the part of the patient. Major Acton has found experimentally that emetine acts better in an alkaline than in an acid substrate. We are now testing different measures, such as local alkaline irrigations, in order to try and raise the pH of the colon mucosa and to supplement emetine treatment.

Secondly, a study of their pH environment may be of assistance in attempts to culture the human entamœbæ and intestinal flagellates on artificial media. Most protozoal blood culture media now in current use have a pH of approximately 7.0 (thus readings with Wenyon's medium for *Spirochaetes* gave 7.4, and of a Row's hæmoglobin medium for *Leishmania* made with rabbit blood readings of 7.38 and 7.30 and a modified Row's

TABLE II
Experimental Amœbic Dysentery in Kittens

Kitten No	Date of Injection	No of days to onset of Symptoms	RESULT	Protozoal and P M Findings	pH Findings	REMARKS
I	Rectal injection 16 9 22	Dysentery on 3rd day	Chloroformed 6th day	Passed stool 3rd day = R. B Os++ Mucus++ Motile <i>E histolytica</i> +++ Strongyloid larvæ+ Colon contents = R B Os++ Mucus++ Motile <i>E histolytica</i> ++	pH of freshly passed stool = 6.47 Fresh colon contents = 6.47 Colon wall = 6.24 Minced up colon wall emulsion = 6.24.	Colon contents passed into kitten No II
II	Rectal injection from No I 19 9 22	Acute dysentery on 7th day	Chloroformed 8th day	Colon contents = R B Os++ Mucus++ Motile <i>E histolytica</i> ++ Trichomastix type of flagellate+	Heart blood = 7.17 Minced liver = 6.17 Colon contents = 5.56 Rectum = 6.14	Colon contents passed into kitten No III.
III	Rectal injection from No II 27 9 22.	Tenesmus Emaciation No dysentery on 21st day	Chloroformed 34th day	Passed stool, 21st day = coccidial oocysts+++ No <i>E histolytica</i> seen Colon contents = R. B Os+ Leucocytes+ Occidial oocysts++ No <i>E histolytica</i> Large gut healthy small intestine intensely congested.	Passed stool = 4.4 None taken	Natural coccidiosis had clearly destroyed all chance of <i>E histolytica</i> infection The acidity of the stool is to be noted
IV	Rectal injection 2-11 22	Acute dysentery on 5th day	Chloroformed 8th day	Passed stool, 5th day = R B Os++ Mucus++ Motile <i>E histolytica</i> ++ Passed stool, 6th day = No blood or mucus seen Many vegetative <i>E histolytica</i> , but all non motile and dead Severe ulceration of of colon and caecum R B Os++ Motile <i>E histolytica</i> ++ Occidial oocysts++ Strongyloid ova and larvæ+ Ascaris ova+	Passed stool = 6.20. Not taken Colon contents = 6.14 Colon wall = 6.60 Liver = 6.48 Stomach wall = 6.70	Kitten seems better Stool semi formed? recovering Experimental amœbic infection being ousted by naturally acquired coccidiosis
V	Rectal injection 29 11 22	Acute dysentery on 6th day.	Chloroformed 6th day	Colon severely ulcerated R. B Os++ Mucus++ Scanty motile <i>E histolytica</i> + Occidial oocysts+++ Scanty strongyloid ova+	Colon contents = 6.36 Minced colon wall = 6.44 Liver = 6.57 Blood (two observations) Both = 6.94. Blood dialysate (after shaking off all CO_2) = 7.63	
VI	Rectal injection 29 11-22	Emaciation	Died 13th day	Died from pneumonia Right lung Some congestion of gut No blood or mucus Scanty vegetative <i>E histolytica</i> (all dead) + Spirochaetes + Occidial oocysts+	Colon contents = 6.52	
Control	Non injected Healthy kitten		..		Heart blood = 7.29 Minced liver = 6.14	

medium made with cat blood and containing 1 per cent glucose and 2 per cent sodium taurocholate readings of 694 and 698) We have made two preliminary attempts to cultivate vegetative *E. histolytica* in media containing defibrinated cat blood, 1 per cent glucose, 2 per cent sodium taurocholate and a piece of fresh cat liver, but both have been unsuccessful We are at present investigating methods by which such media can be reduced for attempted cultures of *E. histolytica* to a pH = 6.2 and raised for attempted cultures of the intestinal flagellates to a pH of 7.4 to 8.0

Cases

The work here recorded is of a purely preliminary character but a number of dysentery cases which have subsequently occurred and which have been studied from the pH point of view may perhaps be quoted —

Case 1—G. W., American male, adult, 48 years. Two years in India with incessant relapses of acute and subacute amoebic dysentery. Whole colon probably severely ulcerated sloughs in stools. Between May and August two further severe attacks with active *E. histolytica* in stools. Patient drenched (unsuccessfully) with emetine. Condition at times critical but colon finally settled down under local irrigations. No *E. histolytica* found in six final consecutive weekly examinations of the stool but patient sailed for America with stool still at a pH of 6.35 i.e., one still suited to active *E. histolytica*. Prognosis very doubtful.

Case 2—M. M., English male, adult, 41 years. Two attacks of amoebic dysentery in July and September 1922, with *E. histolytica* in stools. Recovery under emetine. On 16th October admitted to hospital with recurrence of dysentery. Stool examined six times in next twelve days. All attempts to find *E. histolytica* unsuccessful. pH of the dysenteric stool 8.98. Flexner bacillus isolated and patient did well on an autogenous vaccine. Here previous amoebic infection apparently eradicated but secondary infection with bacillary dysentery set in.

Case 3—Outpatient. J. N., English male, adult, 48 years. Two attacks of amoebic dysentery. Semi-formed stool with adherent mucus and blood, 12th September, 1922, shewed vegetative but dead *E. histolytica*, vegetative and encysted *Giardia*, and cysts of *I. butschlii*. pH 6.80. After convalescence, diarrhoeic stool on 23rd October, 1922, shewed *Giardia* cysts and no *E. histolytica* found. Charcot-Leyden crystals present. pH of stool 7.64.

Case 4—R. W., English male, adult, 31 years. Two years in the country, during which he has had six attacks of amoebic dysentery, and drastic emetine treatments. After an emetine course in hospital, his stool on 12th September, and 24th October, 1922, shewed only Charcot-Leyden crystals, pH 8.4 and 7.78, and he went to the hills. On 6th December, 1922, the patient came back to Calcutta with a further relapse the stool being full of motile *E. histolytica* and Charcot-Leyden crystals, pH 6.48. He was again put on emetine and Deeks' bismuth treatment, 180 grains of bismuth subnitrate suspended in half a glassful of water every three hours. The stool was examined daily. No further vegetative *E. histolytica* was seen and the pH rose steadily, the daily readings being 6.62, 7.29, a few *E. histolytica* cysts seen, 7.52, 7.78, 7.86, 8.18. Case now under weekly observation as an outpatient.

Case 5—J. L., Anglo-Indian male, adult, 42 years. Old standing chronic amoebic dysentery case repeatedly drenched with emetine. Admitted to hospital for examination on 2nd December, 1922. Vegetative and encysted *E. coli* present, Charcot-Leyden crystals constantly present, but *E. histolytica* never seen.

readings of stools taken almost daily 6.79, 6.99, 6.96, 7.5, 7.6. Case still under observation. Present treatment dimol and liquid paraffin.

Case 6—A. V. L., Anglo-Indian male, adult, 31 years. Relapsing amoebic dysentery. Admitted with diarrhoea, which passed into amoebic dysentery. For two days fluid stools shewing yeasts and Charcot-Leyden crystals, no *E. histolytica*. Third day, red blood corpuscles, mucus, and very sluggishly motile *E. histolytica* present. pH 7.48. Emetine now given. Fourth day blood and mucus still present, vegetative *E. histolytica* very scanty, Charcot-Leyden crystals numerous. pH 7.48. Still under treatment.

Case 7—Outpatient. English male, adult. Discharged cured recently from the London School of Tropical Medicine. Acute relapse of dysentery on return to Calcutta. Stool of 29th November, 1922, full of red blood corpuscles, mucus, and motile *E. histolytica*. pH not taken. Kept off all treatment for 24 hours in order to obtain further material. Saline aperient only given next morning. The next stool was full of red blood corpuscles, mucus and vegetative *E. histolytica* which, however, were all rounded up and dead. pH 8.22. Here apparently the sudden change to alkaline environment from the aperient given had killed all the motile *E. histolytica* in the lumen of the gut.

Case 8—G. E. M. R., English male, adult, 28 years. Admitted for treatment of *Tania saginata* infection, 12th December, 1922. Formed brown stool with adherent mucus found to be full of *E. histolytica* cysts of average diameter 14 μ shewing magnificent chromatoid bars. Scanty *E. coli* cysts also present, pH 8.34. Patient denies ever having had any dysentery at all, healthy carrier. Daily examinations of stool gave similar findings with pH readings of 7.52, 7.78, 7.51. Still under observation.

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STRONGYLOIDOSIS

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Strongyloides stercoralis is a fairly common intestinal parasite in Orissa. Out of 300 stools examined at Puri Jail and Sadar Hospital, this parasite was found to occur in 49 cases (16.3 per cent). Statistical information regarding the prevalence of strongyloidosis in various tropical countries is still wanting, except for a few places, viz., Central Africa 1.5 per cent (Daniels), West Africa 0.65 per cent (Wellman), and Porto Rico 0.8 per cent (Commission). Osler found it in about 3 per cent of medical patients in the Isthmus of Panama, and in about 20 to 30 per cent of the patients in the insane division. Powell found it in India in 15 out of every 20 cases of anaemia. The literature on the subject of strongyloidosis is scanty, and owing to the belief erroneously held by many authorities that it is not pathogenic, it has been relegated to a secondary place in the literature on helminthology.

Strongyloides stercoralis has a good many synonyms, such as *Anguillula stercoralis*, *Anguillula intestinalis*, *Anguillula intestinalis et stercoralis*, *Rhabdonema intestinalis*, *Rhabdonema strongyloides*, *Pseudorhabditis stercoralis*, *Strongyloides intestinalis*, *Leptodera stercoralis* and *Leptodera intestinalis*.

The geographical distribution of strongyloidosis is said to be almost co-extensive with that of ankylostomiasis, the physical conditions necessary for the growth and multiplication of the two parasites being identical. *Strongyloides* are found not only in tropical countries, e.g., India, Ceylon, Cochín China, the Philippine Islands, Africa, Brazil, West Indies and many places in Oceania, but are also prevalent in certain parts of Europe and America, e.g., Italy, Germany (occasionally), round the Gulf of Mexico and near the Isthmus of Panama.

Association with other parasites—*Strongyloides* occur more often in association with other intestinal parasites, especially *Ankylostoma*, than alone in the faeces. In 30 per cent of my cases of strongyloidosis *Strongyloides stercoralis* occurred alone in the stool, in 60 per cent it was associated with *Ankylostoma*, in 4 per cent with *Ascaris*, in 6 per cent with *Trichuris trichiura*. 22 per cent exhibited intestinal polyparasitism harbouring more than one parasite, including *Strongyloides*, and in 12 per cent it co-existed with microfilaria in the blood of the same patient. It has been our experience that when strongyloidosis is present with ankylostomiasis in the same patient the condition is more grave, anæmia and emaciation occur more suddenly and become more pronounced, than when ankylostomiasis exists alone, especially if the infection with *Strongyloides* is a heavy one.

Morphology—The larval form of *Strongyloides stercoralis* as met with in the stool is a transparent, actively motile, rhabdite embryo with an attenuated head end and a sharply pointed tail. It has a short buccal capsule, double oesophageal bulbs, a row of pigmented cells extending to the tail end surrounding a median narrow intestine which ends in an anal opening a little above the tail end, and some genital cells at one side of the body a little above the junction of its middle with the lower third. The forms we most commonly met with in the stool were about 0.2 to 0.25 mm in length and 0.016 mm in breadth (Fig 6). These larvæ have got a strong resemblance to the larvæ of the hookworm and it is therefore important that one should be able to distinguish between them. The points of difference between the two are (1) the buccal capsule in the *Strongyloides* larva is much shorter than that of the hookworm larva, in fact the buccal capsule of the hookworm larva is about as deep as the diameter of the larva at the posterior end of the capsule, that of *Strongyloides* is only half as deep (Fig 12), (2) Hookworm larvæ can never be found in the freshly passed stool, (3) *Ankylostoma* larvæ are generally found devouring faecal matter, *Strongyloides* larvæ never

do so, but simply move about in the faeces. The eggs or ova of *Strongyloides* rarely appear in the stool. It is generally believed that they can never appear in the stool unless violent purgation occurs. Thayer found only 2 eggs in daily examination of a case for months. I have, however, found *Strongyloides* eggs in the faeces on several occasions even when the patient was not suffering from diarrhoea and I am therefore inclined to believe that they are not so rare in the stool as they are believed to be. The ova of *Strongyloides* are so similar to the ova of *Ankylostoma* that it is sometimes impossible to distinguish between them (Figs 1a and 1b). The points of difference are (1) *Strongyloides* ova have no regular segmentation of the granular mass like the ova of hookworm, (2) the granular mass seems to be much more coarse and its outline more irregular than that of *Ankylostoma* ova, (3) their size (about $50 \times 30 \mu$) also seems to be very slightly smaller than that of *Ankylostoma* ova. On meeting with such an ovum in the stool one can almost certainly expect to find a *Strongyloides* larvæ in the same specimen. As according to the prevalent opinion one does not expect to find *Strongyloides* ova in the ordinary stool and as *Strongyloides stercoralis* as a pathological parasite is little known, these ova, in a hasty examination, would be easily taken to be *Ankylostoma* ova and the case taken to be a case of ankylostomiasis.

To make certain that these ova were really *Strongyloides* ova I transferred the contents of the slide to a small watch glass and mixed them with water slightly acidulated with carbolic and kept it at room temperature (82° F). After 24 hours a mature embryo with greenish granules was formed in one of the eggs (Fig 2). I could not find the other two eggs that were in the original slide. When trying to look at the object with the high power of the microscope, the lens of the latter rubbed against the cover slip and displaced it a little. But this little accident mechanically delivered the embryo out of its sheath, which I then found lying empty by its side (Fig 4). The embryo thus mechanically delivered remained sluggish for some time in an attitude of wriggling (Fig 3) and then began movement. This young embryo was then incubated under the cover-glass by the method described below and grew to about 0.2 mm in length and when stained by introducing a little dilute methylene blue solution under the cover-glass exhibited the short buccal capsule characteristic of *Strongyloides stercoralis*. It did not, however, live for more than 12 hours after that, owing perhaps to its premature birth.

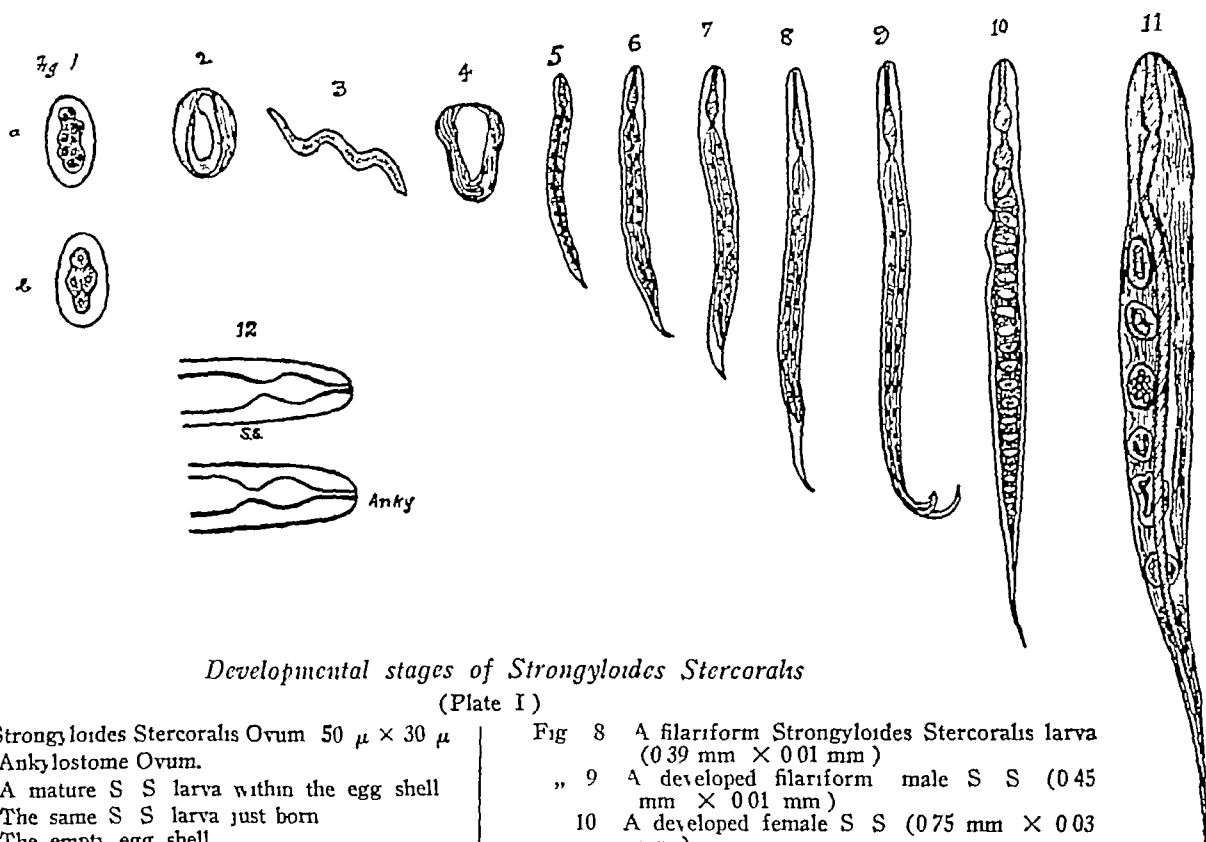
I had opportunities of seeing some newly hatched *Strongyloides* larvæ in stools. They were about 0.18 mm in length and about 0.009 mm in breadth (Fig 5). They were small wriggling bodies, with very sluggish movements at first, but developed active powers of motility very soon. At first no oesophageal bulb is visible and the whole of its body is stuffed with greenish

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Developmental stages of *Strongyloides Stercoralis*

(Plate I)

- Fig 1a *Strongyloides Stercoralis* Ovum $50 \mu \times 30 \mu$
 " 1b *Ankylostome* Ovum.
 " 2 A mature S S larva within the egg shell
 " 3 The same S S larva just born
 " 4 The empty egg shell
 " 5 A new born S S larva ($0.18 \text{ mm} \times 0.009 \text{ mm}$)
 " 6 An ordinary rhabditiform larva of S S ($0.22 \text{ mm} \times 0.016 \text{ mm}$)
 " 7 A grown up S S larva ($0.25 \text{ mm} \times 0.018 \text{ mm}$)

- Fig 8 A filariform *Strongyloides Stercoralis* larva ($0.39 \text{ mm} \times 0.01 \text{ mm}$)
 " 9 A developed filariform male S S ($0.45 \text{ mm} \times 0.01 \text{ mm}$)
 " 10 A developed female S S ($0.75 \text{ mm} \times 0.03 \text{ mm}$)
 " 11 A mature female S S with developing eggs inside ($0.88 \text{ mm} \times 0.035 \text{ mm}$) under one-sixth objective
 " 12 Buccal capsules of S S and *Anky* larvae compared (After Morris)
 " 13 The cover-glass method (Diagrammatic)

looking granules, with some big round granules at the spot where the œsophageal bulb is forming (Fig 5a)

Development of Strongyloides stercoralis
Incubation experiments—To study the development of *Strongyloides* larvæ the stool must be mixed with a non-putrefying fluid such as water, and must be supplied with a moderate amount of oxygen. If the stool becomes dry, the strongyloid larvæ rapidly die, as also when germs of putrefaction grow, which kill it rapidly. I at first used to mix the stool containing strongyloid larvæ with carbolic solution (1 in 10), but it was always a matter of difficulty to ascertain how much carbolic to add, for if more than what is necessary is added, the larvæ would die, and if less, the germs of putrefaction could not be prevented from growing, and these would kill the young larvæ.

The Cover-glass method—To counteract the above difficulties, I devised a simple and expedient method. A little fresh stool containing strongyloid larvæ is put on a clean microscopic slide, mixed with a little sterile water and covered with a thin cover-glass. As the larvæ are more abundant in those parts of the stool which are moist, the specimen should be prepared from such material, preferably from the interior and not from the surface of the stool, which becomes dry very soon. The cover-glass is put on in such a way that there is no air bubble beneath it. The three sides of the cover-glass should now be perfectly closed with vaseline and the fourth side partially so, so that little intervals are left for the air to get in (Fig 11). The specimen is then kept in a closed almira, or an incubator which is not working, i.e., at room temperature (80° to 85° F). The advantages of this method are that (a) a moderate amount of air will get beneath the cover-glass, yet the stool will not dry up rapidly, (b) germs of putrefaction will not grow, (c) the slide is always ready for examination and the growth of the rhabditiform larva into the filariform larva can be seen under the microscope in all stages of its development. The only precaution that is necessary is to introduce a little sterile water beneath the cover-glass every 24 or 48 hours as the stools become dry, by removing the vaseline from the fourth or partially covered side, and introducing the fine edge of a cataract knife dipped in water beneath it. This helps to replenish the little water needed without disturbing the larvæ greatly. The side is to be again partially luted with vaseline as before. Even without this precaution the larvæ would live for about a week, and would be found near big air bubbles, into which they are found occasionally to dip their heads to get, as it were, a sniff of oxygen.

By the method described above, larvæ have been kept alive for about two weeks and their full development into the filariform larvæ and into the male and female forms studied. The temperature most suitable for this development has been found to be 75° to 85° F. Young rhabditi-

form larvæ, about 0.18 mm, have been found to grow into the filariform larvæ, about 0.45 mm in length. After growing into the filariform stage, a further differentiation into the two sexes occurs, even within 48 hours. The female forms (Fig 10) are much bigger than the male forms being about 0.7 mm in length and more than double as broad as the male forms. Their bodies are found full of eggs, which have been found to develop inside them under the cover-glass and discharge very minute rhabditiform larvæ. This second generation may grow under the cover-glass if the specimen has been properly prepared. The female forms have their tail ends drawn out into a very fine straight point, and have got a blackish alimentary canal which stretches along the whole length of their bodies, to end a little above the tail end. The male forms have no eggs inside, have curved tails, and two spicules on the cloaca (Fig 9).

From the above descriptions it is evident that the cover-glass method is a very suitable method for studying the development of *Strongyloides stercoralis*.

Life History—The parent worms which are about 2 mm by 34 μ lie deeply in the mucous membrane of the intestine and the ducts communicating with it, e.g., the ducts of Lieberkühn. They may sometimes be found even in the biliary and pancreatic ducts. The sex of the parent worms are unknown, some say that they are hermaphrodites, some say there are parthenogenetic females. The eggs are said to be oviposited into the mucosa of the host's intestine, to incubate in the fæces and to be passed a day or two afterwards. How often the parent worm breeds, or if there is more than one parent worm, and whether all of them breed together are matters very difficult to ascertain. But by counting daily the number of larvæ in 3 or 4 slides prepared from the stool of the same patient who usually showed a large number (30 to 40 per slide) I observed that at an interval of 10 to 15 days there was a sudden rise in the numbers, which rose to 150 or even 250 per slide. During this stage larvæ were found lying in big groups or rows of 10, 20, 30 or even 40 in different parts of the slide. These forms are actively motile, of medium size or even smaller, and seemed to be newly hatched. These observations would lead one to believe that *Strongyloides stercoralis* breeds at least twice a month.

Symptoms—When strongyloid infection is associated with infection by *Ankylostoma* or *Ascaris*, it is impossible to separate the symptoms caused by *Strongyloides* from those due to the latter parasites. When present in small numbers, strongyloid infection may give rise to no symptom other than intestinal catarrh and a slight tendency to diarrhoea. Whilst ordinary individuals have only one motion per day, a patient with strongyloidosis has a tendency to two or three stools a day. But they do not generally feel any weakness on account of this. If their blood is examined at this stage, however, their

hæmoglobin percentage would, in all probability be found to vary from 40 to 60 per cent and though healthy looking, and even, fat, their weight would, in most cases, be found to be less than the average for a man of their height by 5, 10, 20 or even 30 lbs. The local jail figures show that a majority of the prisoners who are "under weight" harbour either hookworm or *Strongyloides* or both

counting the number under two heads—the living and the dead larvæ found. Sulphur showed a temporary beneficial effect, which passed off as soon as the remedy was discontinued. Carbon tetrachloride was also used in the same case without much benefit. As yet no suitable remedy for strongyloidosis has been found.

My thanks are due to my chief, Dr P N Das, F R C S E, Civil Surgeon and Jail Superintendent,

Name.	Sex and Age	Intest Para site	Hb Per cent	BLOOD COUNT					Symptoms
				Poly	Small Mono	Large Mono	Eosino	Trans	
Chandra Naik	H M 28	S S only	Per cent 45	Per cent 51	Per cent 19	Per cent 4	Per cent 22	Per cent 4	3 motions per day, semi solid, feels weak
Parma Behera	H M 40	S S only	45	53	24	3	18	2	1 motion daily.
Nata Behera	H M 40	S S only	60	53	31	4	10		1 or 2 motions semi solid.
Goitri Krishnama	H M 35	S S only ...	50	54	21	3	18	3	2 motions liquid
Ganga Lanka	H M 50	S S Ova (?) & Larva	50	65	7	3	21	4	1 or 2 motions, solid
Murali Lanka	H M 30	S S Ova (?) & Larva	40	79	13		8		2 motions daily
Cripa Padhan	H M 35	S S & A L	60	64	22	2	11	1	2 motions semi solid
Chinta Parida	H M 30	S S & Anky	50	73	19	1	6	1	2 or 3 motions, semi solid or liquid
Dharmu Bhoi	H M 40	S S & Anky	60	40	28	8	23	1	1 motion daily
Hara Prosad	H M 55	S S & Anky	30	63	24	4	5	4	3 or 4 motions
Gobinda Paikaji	H M 30	A L, T D S S & T D No amœba found	40	60	18	2	22		Liquid motion blood and mucus for 15 days

Some authorities consider *Strongyloides* to be the cause of sprue. When present in large numbers they may cause intermittent diarrhœa (Loos) or even "continuous diarrhœa, anæmia and emaciation" (Hare). That they may cause diarrhœa is admitted by a large number of authorities, e.g., Loos, Manson, Osler, Hare and Caille and that they may cause anæmia is admitted almost unanimously. Darling, however, concludes from his studies that *Strongyloides* are not the cause of severe diarrhœa, though they may cause moderate anæmia. The following table shows the blood picture and symptoms of some of the cases of pure strongyloidosis and mixed infection investigated by us.

Treatment—Thymol given in the usual dose of 30 grs, Manson's mixture, betanaphthol, etc, had no effect on strongyloid infection in several cases in whom a mixed infection of *Ankylostoma duodenale* and *Strongyloides stercoralis* existed, although ankylostome ova disappeared under such treatment. Sublimed sulphur in doses of 10 to 15 grs twice daily, pushed up to a total dose of 250 grs, was tried in a case which showed a large number of *Strongyloides* (in which ankylostome ova disappeared under treatment with Manson's mixture and thymol). The effect of sulphur was studied by examining every day 4 slides prepared from the stool of the patient and

Puri, for kindly allowing me to examine the blood and stools of Jail prisoners, and my gratitude to Colonel Sir H E Banatvala, Kt, CSI, IMS (Retd), late officiating Inspector-General of Prisons, Bihar and Orissa, for kindly reviewing this article and suggesting corrections and alterations.

THE OPERATIVE TREATMENT OF TRACHOMA BY EXCISION OF THE FORNIX

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To treat trachoma by the application of caustics and astringents is a tedious, long, and unsatisfactory process. In order to shorten the course of the disease, it is imperative to find some surgical treatment. The object of surgical treatment is either to remove the new granulation tissue by emptying granules or to remove the granule-bearing area of the conjunctiva. In the early stages of the disease, the emptying of the granulations by curetting or by expression is advocated by some to be the best line of treatment and such operators advise its trial in every case, but I personally think that removal of the area covered with granules can very well replace the old-fashioned treatment of expression. The

combined excision of the fornix and tarsus is useful in this stage of the disease

Galezowski about 1874 advised excision of the retrotarsal fold, which contains the mass of trachoma granules that commonly escape treatment by the usual applications of caustics, etc. Heisrath in 1882 added to this the removal of the upper part of the tarsal plate. This procedure fell into disuse, but was revived by Kuhnt in 1897. It has been much advocated in Italy by Addario and in the United States by various surgeons, especially Wootton and Claiborne. By this operation the duration of treatment of the disease is greatly reduced, corneal complications are prevented or cured and reinfection in most cases avoided.

The operation which I propose to describe differs a little from many of the book operations, and is the one usually performed at the Mayo Hospital, Lahore, where I worked as a House Surgeon for a year under Lieutenant-Colonel H. Ainsworth, M.B., F.R.C.S., I.M.S. I am especially obliged to him for the encouragement which he gave me in writing this paper and for allowing me to use the records of the cases.

Operation

Indications —

- (1) In all cases with large follicles in the fornices and palpebral conjunctiva.
- (2) In all cases in which involvement of the cornea is threatened or has just begun (pannus, small ulcers, etc.)

Contra-Indications —

- (1) In cases in which the conjunctiva is extensively scarred or becoming xerotic.
- (2) During intercurrent acute infections.

Preparation of the Patient—As in other cases when general anaesthesia is required.

Anaesthesia—General in all cases.

Instruments —

- (1) Two pairs of fixation forceps, (2) one Graefe's knife, (3) a metal spatula, (4) one curved blunt-pointed scissors, (5) four fine half curved needles, (6) a needle holder, (7) fine silk for sutures.

Operation—With the patient lying down, the upper lid is everted, and the surgeon seizes the prominent convex border of the tarsus and doubly everts the lid so as to bring the fornix well into view. An incision is made with the Graefe's knife through the conjunctiva only, from the inner to the outer canthus at the junction of the diseased granular fornix and the healthy conjunctiva. In making this incision care must be taken that sufficient bulbar conjunctiva is left to cover the part to be removed. The assistant now holds the forceps which keep in position the everted lid. Two fine silk sutures, each about 6 inches long, are threaded with a small needle at each end. The needles are passed through the upper lip of the

conjunctival wound from above downwards. The two needles belonging to each suture are entered 1/10th of an inch apart. The two mattress sutures should be inserted at the junction of the middle and outer third and middle and inner third of the incision. The sutures are held out of the way whilst the next part of the operation is performed. The assistant now removes the forceps from the convex border of the tarsus and introduces a metal spatula between the eyeball and the everted lid. The surgeon steadies the free margin of the lid in the middle and makes an incision about 3 mm from the edge of the lid through the tarsal cartilage. This incision joins the first incision at each end, enclosing the area containing the follicles. The total diseased area thus marked out is then removed. In making the last incision care must be taken that the incision is not further away from the lid margin at either end, so as to leave more diseased area there than at the centre. The assistant now removes the spatula. With a series of short snips with scissors the marked area is freed all along the two incisions. One end of it is raised with the forceps and the whole diseased area is slowly dissected out with scissors. This includes the granulation-bearing conjunctiva and some portion of the tarsus.

It now remains to close the wound. The sutures previously passed are brought through the lid near the second incision along the lid margin on to the skin surface from within outwards. This brings the free margin of the cut bulbar conjunctiva in apposition with the line of the second incision above the lid margin. The sutures are tied over thin India-rubber tubing. All blood is removed from the conjunctival sac and the parts cleaned. The eyes are covered with sterile gauze but not bandaged and the patient is put to bed.

After Treatment—The eyes are washed with 1 in 10,000 perchloride of mercury lotion twice a day for 4 or 5 days, when the sutures are removed.

The advantage of tying the sutures over the rubber tubing is that these do not dig down into the skin surface and can be removed very easily without any ill effects to the patient.

Complications—(1) Haemorrhage, if excessive, is controlled by a pad and bandage which is removed after 24 hours.

(2) Occasionally a button of granulation tissue forms on the line of the scar of the wound. This should be snipped off with scissors.

The operation is only performed on the upper lid.

Fifty-two operations were performed by me last year. I give below a few cases out of these as an example to show the quickness of relief given to the patient and the excellent results achieved in saving the patients from bad results of complications.

SUMMARY OF CASES

No	Name.	Age	Duration of the Disease	Total No of days in Hospital	No of days in hospital after operation	Condition on Admission	Condition at the time of Discharge from the Hospital	Result
1	Khadim Shah	M M 18	6 months	45 days	9 days	Upper lids swollen Trachoma both eyes, pannus right eye, defective vision, conjunctiva congested	Patient is able to open his eyes properly, pannus disappeared, vision much improved, congestion of conjunctiva absent.	Cured
2	Mudaraj	M M 15	Not known	29 days	24 days	Haziness of cornea, pannus, corneal ulcer, trachoma, photophobia and swollen eyelids	Can well open his eyes, sight improved, corneal ulcers healed	Cured
3	Brij Lal	H M 15	2 years	6 days	5 days	Trachoma, photophobia, lachrymation corneal ulcers	Corneal ulcers healed, photophobia and lachrymation disappeared	Cured
4	Sab Khan	M M 60	3 to 6 years	23 days	17 days	Unable to open his eyes properly, photophobia, lachrymation, staphyloma, corneal ulcers	Was able to well open his eyes, corneal ulcers healed, photophobia and lachrymation absent.	Cured
5	Qazi	M M 40	5 years	11 days	10 days	Trachoma, conjunctiva congested pannus, cornea hazy.	Pannus and congestion of conjunctiva absent. Haziness of cornea disappeared vision improved	Cured
6	Jamal Din	M M 36	10 years	28 days	20 days	Trachoma, lachrymation, ulcers of cornea	Ulcers of cornea healed vision much improved	Cured
7	Milkhi	O M 25	2 years	14 days	12 days	Trachoma, congested conjunctiva, one eye pannus and haziness of cornea	Congestion of conjunctiva disappeared, pannus disappeared vision much improved	Cured
8	Beli Ram	H M 35	3 years	29 days	28 days	Trachoma, thickened eyelids, pannus, hazy cornea.	Can well open his eyes, pannus and haziness disappeared vision much improved	Cured
9	Mohd. Din	M M 50	15 days	10 days	8 days	Trachoma, lid margins inflamed, conjunctiva congested, corneal ulcers	Can well open his eyes, corneal ulcers healed	Cured
10	Mian Khan	M M 12	1 year	26 days	12 days	Trachoma, congestion of conjunctiva, corneal ulcers, lachrymation and thickened eyelids	Congestion of conjunctiva disappeared, corneal ulcers healed, lachrymation disappeared	Cured
11	Pir Bux	M M 25	2 years	20 days	19 days	Trachoma, corneal ulcers, defective vision	Corneal ulcers healed vision much improved	Cured
12	Kher Bibi	M F 13	1½ years	26 days	25 days	Trachoma, swollen lids, ulcers of cornea	Can well open her eyes, corneal ulcers healed	Cured

A DAY IN THE LIFE OF A PORT HEALTH OFFICER

By DR. A. BAYLEY DE CASTRO,
Assistant Port Health Officer, Rangoon

THESE notes refer especially to an Assistant Port Health Officer, the Port Health Officer's duties being mainly administrative with a daily round of supervision to be certain that there is no hitch in the clockwork routine of the executive staff. And so let me introduce you to him (the APHO) at early dawn, for

be it sun or rain, fine or foul, he is always at the jetty or on his launch at 5-30 a.m. He is always a cheery sort of biped before he has boarded a ship, more especially before boarding one like the Coromandel mail with its thousand or more Koringhee coolies

On arrival at the jetty, his first concern is the mustering of his staff which consists of a Sub-Assistant Surgeon, a clerk, a nurse, a European Police Sergeant and 3 or 4 Indian constables. Once this muster is correct, he phones down to the Signal Station to enquire

if his particular ship has been sighted, and whereabouts she is. We next see him on his launch with a bright yellow flag flying at the foremast tearing down towards the Hastings Bar for it is after crossing this that all ships have to be boarded, papers examined, and then pratique given for the vessel to proceed to mooring or wharf. The preliminary procedure on boarding a ship is to have a few words with the ship's doctor, if there is one, or else with the clerk, from either of whom it can be ascertained if there are any sick. In the event of there being any, it is necessary to see them and satisfy yourself as to the correctness of the diagnosis. On one occasion a case of "simple diarrhoea" proved, on careful clinical examination, to be one of well-established cholera, which was subsequently confirmed bacteriologically. Then the Captain must be seen on the bridge, courtesies exchanged and pratique given. It is a good policy, if the Captain has any sort of mongrel, to play with it for a while, and swear that you will "pinch it" one fine morning.

Let us now consider the arrival of an emigrant ship, the "Coconada" for instance. Her complement of freight is invariably about 2,000 to 3,000 coolies, and about 200 to 300 pigs. She generally arrives from the Coromandel coast, and is popularly known as the "Irish Mail." The Assistant Port Health Officer, on boarding her, immediately orders the Captain to proceed to Brooking Street jetty which is the Port Health Station jetty.

Once safely tied up there, the passengers are disembarked and under the guidance of police constables are directed into the Port Health Station sheds. These are very large corrugated iron sheds divided into sections by means of wooden railings. At the first barricade or rails the Customs' authorities take up their stand and search the kit of passengers. They are then formed up into two single file lines and proceed to the wickets of barrier No 2, where the Assistant Port Health Officer and his Sub-Assistant Surgeon have taken up their stand. Here they are examined for a rise of temperature, for plague, small-pox and any other infectious disease that may show itself. Those who are fit then pass out through the big doors of the shed and are soon lost to view. Those with any temperature are sent into the enclosure for sick, to be carefully examined afterwards, and those not protected against small-pox are passed on to the vaccinator behind another barrier. For women passengers there are closed rooms where the nurse examines them and takes temperatures, and also where the police lady searcher does her work. After all the passengers are seen, attention is then directed to the vaccinations, these are examined and then the men are allowed to go, then a careful examination is made of all the sick that have been collected. These are

finally disposed of by being sent to the General Hospital or the Municipal Observation Hospital, and after their despatch the Assistant Port Health Officer once again smiles, for here endeth the first part of his labours for the day. By now the time is 9 or 9-30 a.m. and, be it noted, that the account so far has referred to a straightforward clean day. An infectious case detected on the ship, would mean disinfection of all effects of patient and contacts, also, of course, of the ship and despatch of all contacts to quarantine.

Then, again, the boarding of a vessel under way is not by any means free from risks, and on one occasion, for a good five minutes, the Port Health launch was in great danger of being smashed by the propellers of a big Henderson Liner. The launch had come up from the back and was racing for the gangway when the ship dropped her anchor and started to go astern, this set up an enormous swirl and suction and began to draw the launch in. At other times, a slippery gangway and a "bit of sea" render matters unsafe, whilst, lastly, the gangways themselves are not always firm and the steps slope at very obtuse angles.

Let us now consider the duties in connection with an out-going vessel. The Port Health Officer intimates to the Agents a day previous to the sailing of the ship that the crew should come up with their entire kit for disinfection at a certain hour, invariably about 4 hours prior to that of sailing. Also that their quarters should be thoroughly scrubbed and cleaned, and bunk boards removed and sunned, while the bunks are washed down. Further, that the whole ship must be in a satisfactory sanitary condition prior to sailing, that the deck, 2nd class, and saloon passengers should be present at stated hours on the day of sailing at the Port Health Station for examination. The Assistant Port Health Officer then once more wends his way to the Port Health Station. On arrival of the crew in the Disinfecting Shed all their boxes are at first arranged along the wall, opened and the entire contents removed. The boxes are then removed outside where they are washed down both inside and out with cresol lotion, and at least 80 per cent of the cockroaches, beetles, bugs, cloth insects, etc., killed. All these boxes, built very nearly as per specifications of the Board of Trade, have a till on one side, and it is most interesting to note how these verminous creatures dart off for protection under this till. The contents of the boxes and bedding are then sorted out—all dirty linen being removed for disinfection. Once or twice by accident on the part of the owner a woollen or leather article has gone into the disinfector inside a kit bag, with of course very disastrous results, and extreme surprise and sorrow mingled on the part of

the owner But such occurrences are very rare, owing to the proficiency and vigilance of the staff in the disinfecting room, and the supervision of the Assistant Port Health Officer and his Sub-Assistant Surgeon and clerk

After the boxes, clothes and bedding have been removed for disinfection, attention is directed to the clothes worn by the crew. A Goanese saloon boy looks quite smart in a white drill suit and well-whitened shoes, but closer inspection often reveals a very dirty shirt or singlet and pair of socks and often an unclean body, and similarly with all the rest of the crew, the majority of whom are in rough jumpers and slacks of blue dungaree. All these are given a blue "lungi" to wear while their clothes are being boiled. By now everything is ready for disinfection and the process is commenced, while the crew line up for muster, and inspection for plague, small-pox, any of the exanthemata, leprosy and pyrexia. In one end of the disinfecting room is a small vat about 2 feet deep and filled with a weak solution of cresol lotion, this is meant for a bath, but law and "red tape" presumably do not like antiseptic baths, and so we dare not "order" the crew to bathe but "ask them" to wash their feet and hands. After the first couple have gone in, and the rest see that there is only a foot of water, they boldly enter and fool one another by splashing about the solution, incidentally having a decent wash down so much for the irony of red tape. Shoes and boots are washed in a bucket of lotion. There is one rule I strongly advocate, and which I would like if I had the power to put into execution, i.e., manicuring, and this especially in the case of Burmans and Chinese.

I would also very strongly recommend the wearing of a respirator by the examining officers. Many and many an attack of pharyngitis I definitely attribute to the inhalation of epithelial debris from the skin and offensive breath of the passengers as they crowd up in the shed, and even up to the examining wicket. One morning, not so long back, I had 1,540 passengers for examination, and there passed my examining wicket no less than 24 cases of tinea imbricata, five of scabies, two of dermatitis exfoliata and a few dozens of ringworm. The offensive odorous exhalation from a crowd of 500 to 600 who have not performed the duties of personal hygiene for days is undoubtedly the cause of many a headache suffered by the Assistant Port Health Officer and his staff.

However—to proceed—boxes are now brought in wiped, contents packed away and taken into the antiseptic room. Into this room the opposite end of the disinfector opens and here the disinfected articles are delivered. After many shouts, jibes, sighs, groans, moans and possibly anathemas hurled at the Port

Health Department, beddings tied up and boxes fully packed are loaded on to trollies and taken on to the jetty for loading on the launch. During the transit of crew and effects, from aseptic room to launch, the way is cleared of all loitering humanity, and possible contamination as far as is possible prevented. The crew then leaves under charge of two of the junior officers of the ship, and the clerk with strict orders that they are not to mix with any shore gang that may be aboard loading, as a rule these are gone. Attention is then directed to the deck passengers who are treated in the same manner. By now another individual in the person of a ticket collector has attached himself to the staff in the Port Health Station, he checks all tickets sold and possibly sells a few tickets to late arrivals.

After the inspection of the deck passengers, a move is made to the jetty where 1st and 2nd saloon passengers are seen. They of course are not treated in the manner mentioned above, and this for many and obvious reasons. This inspection completed, all passengers and staff board a launch and make off for the ship.

I should have previously mentioned that even the coolies who have to come aboard for loading the baggage have to be inspected, and get their clothes disinfected, so that all who are allowed on board do so as far as is humanly possible with a clean bill of health.

On boarding the vessel it is customary for the Chief Officer to meet you if not you request the Captain to order him to accompany you round on your sanitary inspection. It is only when loading has been going on after the crew has been away, that a certain amount of untidiness and dirtiness is met with. Almost invariably one finds things in a satisfactory sanitary condition. The crew are now allowed to enter their quarters, and the bill of health is filled up and handed over to the Skipper, the Assistant Port Health Officer's last injunctions being, as he is the last to leave the ship and get on to the launch, that the gangway is to be pulled up, the "Yellow Jack" hoisted, and no further communication with the shore allowed. But there is really very little time for this, exceptions barred, as the Harbour Master has already taken possession of the bridge, and the demoorings of the ship has begun.

A Mirror of Hospital Practice.

AN ACCESSORY MOUTH

By DR. A. BAYLEY DE CASTRO,

Assistant Port Health Officer, Rangoon

The photograph published with this account is that of an Indian (Punjabi) about 28 or

30 years of age with a horizontal cleft above the hyoid from which his tongue can be protruded, and deglutition performed



The two horizontal rami of the lower jaw were fused together and occupied a position in the centre of the floor of the mouth, the capacity of which was very small. On the right ramus there was one molar and two bicuspid teeth on the left two bicuspids. The upper maxilla was ununited in the middle line of the palate, about the posterior two-thirds and with ease two fingers could be passed up to the frontal bone.

We of course know that each premaxilla may show two centres of ossification but the cleft is not, as is so often said, the result of failure of union of the two centres of ossification, but is due to the separation of the developmental parts of the palate. As growth goes on the cleft becomes wider. Fusion of the various elements to form the palate commences anteriorly and proceeds backwards. No ethmoid could be felt.

The palate and throat were anæsthetic to a marked degree. The man stated that he could drink liquids from this malformed opening as easily as from his mouth. Any little masticatory work was of course performed by the natural mouth. There was no harelip.

He was in an excellently nourished condition, and stated that, as far as he could remember, he has never had a day's illness. He does not suffer from digestive troubles

in any form, and lives on an ordinary general diet. From the cleft or second mouth there is a constant dribbling away of saliva, and for this reason the man always has with him a small tin pot and a handkerchief.

Streckeisen tells us that accessory glands belonging to the thyroid body are frequently found in the vicinity of the hyoid bone. They are also found in the basal part of the tongue near the foramen cæcum, and it is just possible that the increased salivation was due to these glands being put into a state of hyperactivity by the abnormal situation of the tongue. Treves tells us that "ducts lined with epithelium have been found leading from the foramen cæcum to accessory glands about the hyoid bone."

The tongue can be made to perform all the movements which a tongue situated naturally can do, and, be it remarked, that it is not always protruding, as shown in the photograph, but remains well inside the opening, and for this reason bears an absolutely normal appearance. The patient was quite an intelligent individual to talk to. His voice, of course, was husky.

A CASE OF STONE IN THE BLADDER REMOVED BY MIDWIFERY FORCEPS

By MANGAL SINGH,

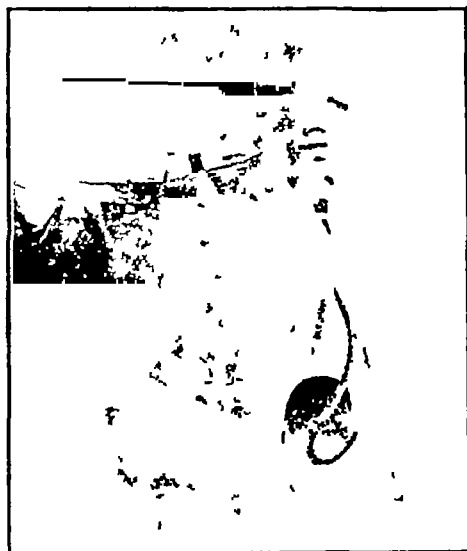
Sub-Asst Surgn.,

I/C, Civil Hospital, Hillah, Iraq

History—An Arab, named Jassimal Hamadi, was admitted to hospital on 13th June, 1922, complaining of painful and frequent micturition and a feeling of heaviness in the perineum which after sounding was found to be due to a large stone in the bladder. Duration (as stated by the patient) one year? The patient was very much emaciated, and debilitated. The urine was clear.

Treatment—He was at once put on urotropine mixture grs 10 t d s, and castor oil 1 oz at bed time. The patient was prepared for suprapubic cystotomy and was operated upon under general anæsthesia on 15th June, 1922. The usual parietal incision was made and the bladder opened, but to my astonishment there was no flow of the fluid (the bladder having been previously filled), as usually happens and on palpating the bladder it felt a globular hard mass suggesting a tumour of the bladder as well as a stone. To be sure of this I again sounded the bladder and confirmed the presence of a big hard stone. The bladder incision was now enlarged and a big stone occupying the whole of the bladder was detected. The stone could neither be caught in the lithotomy forceps nor could it be moved from its place in any direction and hence it was decided to open the peritoneal cavity, and the parietal wound was enlarged to within 2 inches of the umbilicus and the bladder was opened up to its summit, but the general peritoneal cavity was

not opened as yet. Again I tried to remove the stone with hand and forceps, etc., but to no avail. The stone could not even be turned in any direction, and the situation was quite perplexing when it was suggested to me by the Civil Surgeon to try using a pair of midwifery forceps.



I then tried with the cranioclast and put one blade of the cranioclast behind and lifted the stone, and by manipulation of fingers and the blade succeeded in removing the stone from the bladder. The stone was then caught in the midwifery forceps and delivered through the parietal wound. The bladder was sutured after leaving in a drainage tube. The parietal wound was sutured, leaving a space for draining purposes. The patient was given an injection of morphinæ acetate hypodermically.

Daily notes —

	Morning	Evening
16th June, 1922—Temp	99	99.4
Pulse	90	120

Severe pain complained of. Morphine 1½ grs hypodermically. Dressing changed.

17th June, 1922—Passed no motion. Seems better. No signs of peritonitis as yet.

	Morning	Evening
Temp	98.4	99.4
Pulse	96	98

Daily irrigation of bladder, etc., urotropine grs 10 tds.

18th June, 1922—Doing better. Temperature normal. Pulse below 80. Passed two good motions after castor oil. No flatulence.

19th to 20th June, 1922—Nothing notable.

21st June, 1922—Drainage tube removed. There are sloughs in the wound.

22nd to 29th June, 1922—Sloughs clearing. Parietal sutures removed.

30th June, 1922—No sloughs. Wound healing and the patient getting fatter and fitter.

1st to 5th July, 1922—The abdominal wound nicely healing. The patient very cheerful.

8th July 1922—Passed a little urine through the penis.

12th July, 1922—Much urine being passed through the penis. The abdominal wound healing. The urine clear up till now.

15th July, 1922—All the urine passing through the

penis but a few drops through the abdominal wound which is now only a sinus.

18th July, 1922—Wetting of dressing with urine.

4th August, 1922—Still drops of urine from the sinus.

5th to 25th August, 1922—Occasional drops of urine through the sinus.

26th August, 1922—Sinus almost healed. No urine through the sinus.

30th August, 1922—The sinus quite healed. The patient discharged cured.

The following points are of interest in the case. I have not seen a stone bigger than this in my 17 years' medical experience, including 4 years' experience in this hospital. The use of midwifery instruments is a novelty. The absence of peritonitis and sound healing of the bladder wound, though the bladder was cut and bruised irregularly up to its summit, are remarkable.

A CASE OF BRONCHO-MONILIASIS

By SATYA CHARAN SEN, M.B., D.T.M. (Cal),

Demonstrator of Physiology, Medical College Hospital, Calcutta

L. M. M., Hindu male aged 58, an overseer, a man of regular and sober habits, suffered from an attack of low intermittent fever for three weeks in March 1922. The temperature was normal in the mornings and rose to 99°F and 100°F in the evenings. There was no rigor and no double rise. In the third week the temperature came down by lysis. Bronchitis was present from the very beginning. The spleen extended two inches below the costal margin and the liver was palpable. The blood, urine, and sputum were examined (R⁺ B. Cs 4,250,000, W.B. Cs 6,000, Hb 68 per cent. Malarial parasites not found. Widal reaction to enteric positive in 1 in 40 only). There were a few R.B.Cs and a trace of albumin in the urine. The sputum did not show any T.B. or fungi. Quinine both by oral and intramuscular administration having failed to control the fever, he was given two injections of emetine hydrochloride gr 1 each, when the temperature came down to normal at the end of three weeks and he passed through a fairly satisfactory convalescence.

Five weeks later, one evening he felt feverish and the temperature rose to 99°F. The fever went on gradually increasing till the highest temperature was recorded, 105°F in the evening. This time there was a double rise and there was no remission, the daily variations of temperature being two to three degrees. Bronchitis again developed, the liver enlarged markedly and the spleen could be felt three inches below the costal margin. Blood smears examined on the sixth day of illness showed no malarial parasites. As before, quinine proved a failure. On the thirteenth day definite signs of broncho-pneumonia were detected. The cough became very troublesome and harassing and the expectoration markedly increased in amount. The patient began to

bring up a large amount of sputum of a milk-white colour and of the consistency of glycerine, unlike the yellow muco-purulent sputum he was bringing up hitherto. At the same time peculiar white thrush-like patches were noticed on the already badly coated tongue, lips, inner side of the cheek, palate, fauces, tonsils and pharynx, in fact, as far down as one could see into the mouth. The voice became hoarse and swallowing extremely painful. There was tenderness along the larynx and trachea and the neck glands and parotids became inflamed and swollen. In three or four days these patches disappeared on vigorous treatment but left a red, raw and dry mucous membrane. On the fifteenth day the blood, urine and sputum were again examined (RBCs 4,750,000, WBCs 5,750, Hb 50 per cent, no malarial parasites, formol-gel reaction negative, Widal reaction to enteric positive to 1 in 40 only). There were a few RBCs and a trace of albumin in the urine. The sputum did not show any TB or *Bacillus diphtheriae* but numerous oval yeast-like bodies and mycelial threads were found.

A couple of days later the blood, urine and sputum were cultured. The blood culture was negative. *B. coli* were grown from the urine and both *B. coli* and the yeast-like fungi from the sputum.

During the following days the patient showed signs of severe toxæmia with persistent hiccough, drowsiness and low muttering delirium. Alkaline mixture, anti-streptococcal serum, and *B. coli* vaccine were exhibited with no benefit. He rapidly sank and died in altogether a period of five weeks.

The fungus was isolated and had the following cultural characteristics—It grew quite easily on glucose and ordinary agar slant. On glucose agar the growth was profuse, creamy white with a smooth surface when young, which crinkled and became chalky when old. The growth consisted of oval yeast-like bodies and after a few transplantations a few mycelial threads were also seen. There was no ascus formation either in the young or old cultures. In distilled water the fungi lived for fifteen days but produced no asci.

In liquid media the results were as follows—Glucose—Acid and gas. Maltose—Acid and gas. Saccharose—Acid on the second day, acid and gas (slight) on the third day. Lactose—No change on the second day, then media turned very faintly acid. Growth collected mainly at the bottom. Mannite—No change. Galactose—Acid and gas (slight) on the third day. Litmus milk—Acid and no clot.

Staining reactions—Stained well with ordinary stains, and with Giemsa the picture was very characteristic. Most of the cells were Gram-positive and the mycelial threads negative. When old, both stained badly.

Animal experiments were negative. An

emulsion was made in sterile normal saline containing ten million cells per cc. An intra-pleural injection of one cc produced no effect on a guinea-pig in seven days, when another injection of one and a half cc was likewise given to the same animal, but this too had no effect. Another guinea-pig was fed with two cc of the emulsion on each of two successive days with no effect. Again an insufflation experiment on a third with the same emulsion was also a failure, although a successful culture was subsequently obtained from the same emulsion.

Remarks—One of the higher or lower fungi is occasionally met with in the course of routine examination of specimens of sputum for TB. The presence of these fungi may be merely accidental or they themselves may be the causative organisms concerned in the production of the acute or chronic inflammatory conditions of the lungs in which they are found. These fungi, especially of the *Monilia* group, when found in any number, have been regarded as the causative agent even when animal experiments with guinea-pigs have failed to reproduce the disease. These inflammatory conditions have been believed to be curable by autogenous vaccines, although a big dose of potassium iodide has been administered along with the specific treatment and potassium iodide is known to have a specific action on many different fungi. In the above case the fungus isolated from the sputum resembled *Monilia tropicalis* (Castellani) morphologically and culturally, but it proved innocuous to guinea-pigs. The patient, it will be noted, was evidently suffering from *B. coli* infection also, (*B. coli* having been grown both from the sputum and urine), which, it may be argued, determined his end. The mode of infection in this case was clearly by extension from the mouth.

I should like to suggest that before putting the blame on *Monilia* one should exhaust all other possible means of diagnosis. Potassium iodide was not given as the *Monilia* were thought to be accidental.

In conclusion, I desire to thank Dr. Rajani Kanta Chatterji, M.B., an esteemed friend of mine, the physician in charge of the case, from whose notes the clinical materials have been collected.

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FILARIASIS AND HÆMOPTYSIS

By R. N. BANERJI, B.Sc., M.B., B.S.,
Allahabad

A MAHOMEDAN lady, aged about 52 years, a mother of children, had been getting attacks

of hæmoptysis at irregular periods, two to five times a year, for the last five years, three years after the "change of life"

The striking point of her case is that for these five years she has never had any rise of temperature and has no loss of weight and never any sensation of being ill or indisposed, and the appetite has been uniform and there has not been exacerbation in the temperature or pulse rate during the actual hæmoptysis.

Her chest has been repeatedly examined by me, before, during and after the attack of hæmoptysis and also by Capt R K Kacker of the Bhowali Sanatorium, and we have failed to find any real signs in the chest beyond what one of us imagined once to be a little harsh breathing in the right apex.

Three weeks ago the blood from the hæmoptysis was examined by me and to my surprise I found microfilariae in it. I showed the specimens to Capt Kacker who happened to come to my laboratory that day. No T B were found in the sputum and the blood. We then went and examined the patient again, and found no clinical signs whatever.

There is no history of elephantiasis, of elephantoid fever, of chyluria nor are there any symptoms to suggest filariasis.

Subsequently repeated examinations of her sputum were made for T B and were negative. The examination made two days after the hæmoptysis showed one microfilaria in one specimen and the rest of the films or samples of sputum did not show any microfilaria, T B or elastic fibres from the lungs. Of course there was the usual bronchial flora.

A fortnight after the discovery of microfilariae in the sputum I examined her blood at night for microfilariae and found a large number of them in every film of her blood.

Another noticeable feature of the hæmoptysis is that it comes on suddenly and disappears within twenty-four hours and that too with some abruptness, for the subsequent sputa are not even tinged with blood.

There is no doubt that she has got filariasis, but what connection has this with her hæmoptysis?

Is the presence of the microfilariae in the hæmoptysis blood accidental? It may be mentioned here that the bloody sputum in which the microfilariae were first seen was expectorated during the day time.

Is it possible that she has got T B without any external or internal signs and symptoms discoverable by us, and the filariasis together?

So far I have not been able to find any literature mentioning that hæmoptysis is caused by filaria. Is there any mention of such a condition and has any one observed the presence of microfilariae in the sputum in cases known to be suffering from filariasis, for we know that in the day time the microfilariae recede into the lungs?

The character of the attack and stoppage of the hæmoptysis differ a little from the usual attack in cases of tuberculosis.

A CASE OF IDIOPATHIC DILATATION OF THE COLON

By J C DE,

CAPT, I M S,

Medical College Hospital, Calcutta

MAHAMMAD ELIAS, a Mahomedan boy aged 16, was sent by Major V B Green Armytage I M S, with a provisional diagnosis of Hirschsprung's disease which was confirmed as the result of further observation in the Medical College Hospital under Major J D Sandes, I M S.

Complaint—No motion for six days and a dull heavy pain over the abdomen.

History of present illness—Dates back to the time when he was three years old. From this age onwards until he was twelve years old he suffered frequently from attacks of diarrhoea followed by constipation.

He grew up as the years went by, thin and ill nourished and at the same time his abdomen grew more and more prominent.

Since the age of twelve he has suffered from only occasional attacks of diarrhoea, on the other hand constipation has been more and more marked, and he has at times gone without a motion for two to three weeks on end without experiencing any other discomfort save a dull heavy pain. His appetite has been poor throughout and the abdominal enlargement slowly progressive.



Condition on admission—A thin under developed boy, looked about 12 years old. Height 4 ft 7 in.

A very noticeable swelling occupied the left half of the abdomen extending from the

hypochondriac and epigastric regions down to the pelvis. It was pyriform in shape and closely resembled a gravid uterus. No visible peristalsis, was seen over the swelling. On palpation it felt rounded, tense and elastic with no definite edges. No masses were felt through the tumour. It hardened from time to time under the examining hands and was immovable either by manipulation or change of posture. Percussion elicited a dull note over the tumour in the iliac and lumbar regions and a tympanitic note towards the fundus in the epigastric and hypochondriac regions. No distension of the abdominal veins was noted.

Measurement from the umbilicus to the ensiform cartilage—8"

Measurement from the umbilicus to the pubes—6½"

Rectal examination—No valve-like fold or abnormality was detected.

The rest of the body was thin with very little subcutaneous fat in evidence. The chest was flat and measured 3" less in circumference than the abdomen. The eyes were sunken and had dark rings round them. The secondary sexual characters were ill developed.

Blood—R.B.Cs Total 3,400,000
Hb 40 per cent
W.B.Cs 11,000

Differential count—Polymorphs—53
Small lymphocytes—26
Large lymphocytes—12
Eosinophiles—9 } Per Cent

Urine—No abnormality Other internal organs—Normal

Temperature—Average normal or sub-normal. Pulse and respiration average 90 and 24.

Symptoms—Barring those mentioned, were entirely wanting. There was no vomiting, no severe pain, no difficulty in respiration. The appetite was poor and a liquid diet was preferred to a solid diet as the latter increased the sense of weight.

The diagnosis was established by radiography after a bismuth enema. The radiogram speaks for itself. It may be of interest to mention that radiograms after a bismuth meal showed no result of any importance.

Treatment—The patient was at first treated with enemas every 12 hours for two days and kept on a milk diet. The enemas produced fair results and after two days the abdominal swelling had lessened and the discomfort was relieved. The patient was then given one enema a day for eight days and his diet was gradually increased.

The bowels failed to act normally on suspension of the enemas, when repeated doses of liquid paraffin were tried but failed to act.

Subsequently castor oil was given with satis-

factory results. He was then put on to a mixture containing strychnine and abdominal exercise. As a result he had one evacuation a day, the swelling perceptibly lessened and he felt generally well but became restive and insisted on taking his discharge. He was under treatment in hospital for seventeen days.

Hirschsprung's disease or true congenital megacolon is a rare malady. It is characterised by symptoms and signs dating from birth or soon after, such as obstinate constipation, marked distension, active and visible peristalsis, finally symptoms of toxæmia. It is usually fatal in a short time. The other form begins later in infancy or early childhood, causes abdominal enlargement, severe constipation, and is acquired. A contributory factor is supposed to be an unusually long sigmoid producing a kink and a valve-like fold at the junction of the sigmoid with the rectum. No such kink or valve-like fold was demonstrated in the present case either by radiography or rectal examination. It is thought that the primary cause in these acquired cases is prolonged constipation affecting a sigmoid which is unusually long and that such cases do not represent true Hirschsprung's disease, which dates from birth and is fatal in a short time, but represent a stage of a common condition. It is believed that many cases of Hirschsprung's disease are walking about to-day. Some will reach the stage of dilatation when they will be recognised. The time to treat them is before the dilatation occurs.

Treatment—When the disease is well established medical treatment is of little avail. Scrupulous care of the bowels may check the progress, but surgery alone offers complete relief. In greatly weakened subjects a preliminary institution of an artificial anus is frequently advisable to permit of unloading the bowel and improving the general condition. Resection of the affected portion of the bowel is the best operative procedure.

In infants and children internal measures succeed best and should be given an extended trial. They consist in evacuating the bowels as well as possible with enemas. Permanent drainage of the rectum by a rectal tube has been advised.

Infants should continue nursing as long as circumstances permit.

Sedatives should be used for spasm in any part of the bowel.

The sphincter in spasm should be bloodlessly stretched.

Massage, electricity, and diet with bowel irrigations, will often cure early cases. The diet should consist of coarse breads, cereals, green vegetables and agar agar. Much water should be taken. Liquid paraffin is helpful.

I wish to express my thanks to Major J. D. Sandes, I.M.S., and Lieut.-Colonel D. McCay, I.M.S., for permission to publish the case, and

to Assistant Surgeon Ganesh Chandra Sarkar for helping me with the notes of the case

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AN UNUSUAL TERMINATION OF PYO-PNEUMO-THORAX SECONDARY TO PNEUMONIA

By R. V. RAJAM,

CAPT, M B, B S,

Civil Assistant Surgeon, Palamcottah

A HINDU male child, aged 2 years, was admitted to the Headquarters Hospital, Palamcottah, on the 16th October, 1922, with a cystic swelling on the left scapular region, the size of a foetal head

Previous History—It appears that a month before admission to the hospital the child had had an attack of high fever with cough and dyspnoea which lasted for a fortnight. After the subsidence of the fever and the other signs of the disease, the mother of the child noticed a small swelling on the left side of the back, and it began to increase to its present size. The only trouble the child had was a dry hacking cough, worse at night and in the recumbent posture.

On admission—The child had a slight evening rise of temperature to 99.8°. The swelling at the back extended from the supra-scapular region above to the 10th rib below. Horizontally it was limited on the outer side by the posterior axillary fold and on the inner side by the spine. The tumour was warm to the touch, fluctuant and tender. The skin over it was glistening. On percussion, the swelling was hyper-resonant. Breath sounds were heard over the swelling, but they were of a pseudo-cavernous variety. The rest of the chest on both sides was normal to percussion and auscultation. There was no embarrassed breathing and the general condition of the child was good. On exploring the swelling with a needle and syringe, the piston was suddenly shot out of the barrel with the escape of an odourless gas and subsequently of white thin odourless pus. A $\frac{1}{2}$ inch incision was made at the dependent part of the abscess, and the whole of the pus mixed with air was evacuated. After the evacuation of the cavity, it was noticed that there was sucking in and out of air into the pleural cavity with each respiratory movement. Digital examination through the wound revealed a perforation in the chest wall between the 8th and 9th ribs in the line of the angle of the scapula, and the expanded lung substance could be felt through the fistulous opening in the wall. The abscess was dressed with firm pressure outside. The whole cavity was completely obliterated and

the incision healed by first intention in ten days. A microscopical examination of a stained specimen of the pus evacuated showed numerous diplococci with pus cells. It is surmised that the child must have had an attack of pneumonia, and secondary empyema developed, which in time perforated both the lung and chest wall. The pus forced its way through the chest wall and became a gradually increasing subcutaneous swelling. Before perforation of the chest wall, the empyema must have been a pyo-pneumo-thorax. The presence of air in the abscess cavity before incision could only be accounted for by its having once communicated with the lung. There was no obvious disease of the ribs or spine and the general condition of the child was otherwise good. This case is rather an interesting and unusual termination of an empyema secondary to pneumonia.

RELAPSING FEVER IN RAICHUR

By DR. S. MALLANNAH, M.D.,

Hyderabad, Deccan

IN a village named Aksihal near Raichur, a fever unknown in these dominions was raging for some months in January 1922, and on examination, the blood of the patients revealed the presence of the spirillum of relapsing fever. The fever was of short duration, generally a week, and was attended with frontal headache and pains in the limbs. The temperature varied from 103° to 105° F and was attended with jaundice in many cases, with or without enlargement of the liver and spleen. The mortality was high. Later on, the disease was found to prevail in several other villages near Yadgir. The names of the infected villages were as follows: (1) Arikhed, (2) Puspool, (3) Khandpur, (4) Kudangal, (5) Nandipalli. The fever seemed to be confined to one community chiefly, the *Dhed* community. The patients' ages varied from 8 to 60, but the majority of cases were among adults. In a village named Puspool, there were 500 cases and 70 deaths, giving a mortality of 14 per cent. The best stain for *Spironema carteri*, the parasite of Indian relapsing fever, is aniline-gentian-violet. The organism has 4 to 8 curves and has pointed tapering ends. Occasionally it shows a few granules when stained with methyl-violet and is decolorised by Gram's stain. There is a marked leucocytosis present, especially of the large hyaline leucocytes. Examination of a number of mosquitoes, bugs and ticks from infected houses gave negative results. Examination of lice from infected persons, on the other hand, gave positive results in some cases. There were not only *Spironema carteri* present, but they were in enormous numbers, much more numerous than one finds them in the patient's blood and with more curves and in dense masses.

Indian Medical Gazette.

APRIL

EDWARD JENNER

1749-1823

THE centenary of the death of Jenner passed almost unnoticed in India, yet there is no man to whom India owes a greater debt than Jenner. The short, sharp tragedy of death from small-pox has been averted from hundreds of thousands of people in India and the greater long drawn out tragedy of blindness and disfigurement has been prevented in hundreds of thousands of others.

That large numbers of people die from small-pox in India is not the fault of Jenner, he showed the way of escape from the disease



more than a hundred years ago, but even now the lesson is not fully learned and ignorance does not yet admit defeat.

An interesting account of the life of Jenner was given at the commemoration meeting at the Royal Society of Medicine in London by Sir William Hale-White, whilst the French Academie de Medecine held a picturesque commemoration meeting at the same time.

To us, in India, the great discovery of Jenner has a special interest and importance and it is right that we should know something of the man himself.

Unfortunately there is no recent biography of Jenner but, from various sources, a good idea of the man and his work may be gathered.

Jenner was the son of a vicar in Gloucestershire, and, having lost his father in infancy, he was educated by his uncle who was also a clergyman. He became a pupil to a doctor

in his native county and during the period of apprenticeship the seeds of his great discovery were sown in his mind through a chance remark made by a patient. This was that "she could not get small-pox as she had already had cow-pox." At the age of 21 he went to London as a pupil of John Hunter under whose direction he carried out a good deal of work on natural history. He received much encouragement and stimulation from Hunter and on one occasion, when Jenner was disappointed in a love affair, Hunter set him to work on the study of the changes which take place in the hedgehog during hibernation. After two years in London he took up medical practice in his native parish and won the universal respect and esteem of the community. He found out the association between disease of the coronary arteries and angina pectoris, but did not publish his findings lest he should distress his friend Hunter whom he rightly suspected of suffering from the disease. He also made improvements in the use of tartar emetic, a drug which was then in universal use. Ever after hearing the remark about cow-pox, he kept turning it over in his mind and when he discussed it with Hunter the advice which he received was "Do not think, but try, be patient, be accurate." When he referred to the subject in conversation with his fellow practitioners he was somewhat daunted by their opinion that cow-pox did not protect against small-pox. Fortunately, for humanity, he was obstinate and kept turning the matter over in his mind and found out that the eruptions on the udders of cows were not always true cow-pox, and that the vesicles of cow-pox were not active at all stages. Finally, he put the matter to the test in 1789 by inoculating his eldest son with swine-pox and afterwards with small-pox at intervals during the following two years to his great joy the small-pox inoculations failed. Later, in 1796 he took matter from a vesicle of a woman who was affected with cow-pox and inoculated a boy with the material, in this case also a subsequent inoculation with small-pox failed. His account of the incident is given in a letter to a friend as follows —

"As I promised to let you know how I proceeded in my inquiry into the nature of that singular disease the cow-pox, and being fully satisfied how much you feel interested

in its success, you will be gratified in hearing that I have at length accomplished what I have been so long waiting for, the passing of the vaccine virus from one human being to another by the ordinary mode of inoculation

"A boy named Phipps was inoculated in the arm from a pustule on the hand of a young woman who was infected by her master's cows. Having never seen the disease but in its casual way before—that is, when communicated from the cow to the hand of the milker—I was astonished at the close resemblance of the pustules, in some of their stages, to the variolous pustules. But now listen to the most delightful part of my story. The boy has since been inoculated for the small-pox, which as I ventured to predict, produced no effect. I shall now pursue my experiments with redoubled ardour."

As described by his contemporaries Jenner was a short, stout country doctor whose accomplishments as a musician, poet and conversationalist made him an acquisition to the social life of his neighbourhood. He was a man of cheerful disposition but at times he was depressed by a sense of his own indolence for which there appears to have been little justification, as he was a busy doctor whose services were always at the disposal of rich and poor alike. It is related that when the person who was the first to be inoculated with cow-pox fell upon evil days, owing to sickness and poverty, Jenner provided him with a comfortable cottage and stocked his garden with flowers and shrubs.

Honours were heaped upon him, amongst them being a subscription of more than £7,000 from the European inhabitants of India. It was considered right that he should be admitted to the College of Physicians, but an essential preliminary was the passing an examination in the classics. Jenner refused to go in for this and expressed himself in these words: "It would be irksome beyond measure, I would not do it for a diadem."

The examination fetish evidently existed in those days to as great an extent as at present.

A tendency to apoplexy began to be evident during his later years and a final stroke carried him off in January 1823.

It is a curious fact that Pasteur was born about a month before the death of Jenner and

it is not surprising that a suggestion has been made that the torch of science was handed on from the one great spirit to the other. The two were alike in the simplicity and directness of their genius and it was characteristic of Pasteur to insist that the discovery of an attenuated virus should be attributed to Jenner and to apply the name "vaccine" to material introduced into the body for the purpose of preventive inoculation. Many interesting relics of the father of preventive medicine are collected in the Wellcome Historical Medical Museum in Wigmore Street, London, to which a pilgrimage should be made by all who recognise the debt which humanity owes to Jenner.

"ECONOMY" AND MEDICAL RESEARCH

Newspaper reports inform us that the Inchcape Retrenchment Committee have recommended a sweeping reduction of the annual grant for medical research in India.

The report of the Committee is not yet available and it is not possible to criticise the recommendations made, except on broad and general lines.

Medical research does not bring in a revenue which can be measured in rupees, but in spite of this it is by far the most profitable of human enterprises, even when judged on the lowest grounds of economic value. The late war and the construction of the Panama Canal must have opened the eyes of everyone to the commercial value of medical research, and there must be very few families among the more educated classes of India which do not owe the life or health of some member to the discoveries of Sir Leonard Rogers and of other research workers in this country.

For some years the Government of India has steadily followed the policy of encouraging medical research and the public has come to believe that enquiry into the causes and methods of prevention of disease is of the greatest importance to the future development of India. Have the Committee been put in possession of information which convinces them that medical research in India in the future is likely to be sterile? On no other assumption can we understand their recommendation of a sudden reversal of previous policy.

The only other explanation which has been suggested hardly seems credible, it is that though the value of medical research is admitted, yet the financial condition of the country is such that money cannot be found for maintaining medical research on the existing scale. This suggestion can hardly be taken seriously for most of the research workers at the present time are members of the permanent medical service and if they are not paid for doing research work they will have to be paid for doing minor and much less important duties. It can hardly be urged that it is an economy to employ selected research workers on less important work for which they may have no special aptitude. The mere cutting down of the cadre may show a saving on paper but there will be no real economy as there is a great shortage of medical officers and the actual number employed is likely to remain the same.

But if there is no possibility of saving by removing I M S officers from their present research appointments it would be still possible to effect a slight economy by removing the research workers who do not belong to this service. Most, if not all of these are young Indians who have been induced to take up research work because it was represented to them as offering a career in which they could earn a livelihood and at the same time do real service to their country and its needs. Research work does not attract many young Indians, the families of any such aspirants to a scientific career look with a cold eye on the financial prospects which are offered. Would it be real economy to turn adrift those who have taken up research work in spite of the opposition of their families? Their fate would only serve as a grim object-lesson to others who might be tempted to follow in their footsteps. Has this aspect of the question been put before the Committee? Critics of the former Government have accused it of failure to encourage young Indians who desire to engage in research work. Is the new reformed Government prepared to signalise its assumption of power by driving out the men who have already been induced to stake their future on scientific work? We have taken no part in the discussion which has raged of late around the attempts to induce young medical men in Europe to join the Indian Medical Service, but, without expressing any opinion on the

subject we would point out that the Secretary of State has been advertising for candidates for the Service and has held out as a special inducement the increased facilities for research work in India. If the recommendations of the Retrenchment Committee are accepted it will be necessary to amend the advertisement and to point out that there will be diminished facilities for research work in India. What is needed, is a definite policy and if research is to be seriously curtailed, this must be done only after a searching examination into the whole subject. The public will not be satisfied with a blind stroke of the axe in the supposed interests of economy. The organisation of research work is probably capable of great improvement, and it would be in the interests of economy and efficiency to have a careful inquiry made into the working of the department by competent persons without regard to vested interests. It is more than ever essential to appoint such a committee as was asked for by the writer more than two years ago.

At the present moment the proper course for Government to take is clear. The existing machinery for research work must not be scrapped, it should instead be overhauled and made more efficient, otherwise the work of years will be rendered sterile and brought to naught. As Sir Ronald Ross aptly remarks "Parsimony in preventive medicine is the poorest form of Imperial economy."

Current Topics.

The Problem of Filarial Endemicity

At a meeting of the medical section of the Asiatic Society of Bengal held on the 14th February, 1923, Dr. Sundar Rao, Filariasis Research Scholar, Calcutta School of Tropical Medicine, read a paper on "The Problem of Filarial Endemicity." He first reviewed the historical aspects of our knowledge of filariasis and the chief discoveries of historical interest in this connection. Lewis in Calcutta in 1872 was the first to discover microfilariae in the blood of man. To-day in connection with *F. bancrofti* there was no evidence of any life-cycle other than that in man and the mosquito. The endemic areas of the disease lay in the tropics between latitudes 41 degrees N and 28 degrees S in the E hemisphere, and 31 degrees N and 23 degrees S in the W hemisphere. Filariasis was essentially a disease of the sea-coast and of riverine areas. For filariasis to be endemic in any area — (1) the worm must be present in man or the infection imported, (2) the correct and efficient insect carriers must be prevalent and (3) there must be a suitable soil—usually one low lying, swampy and water-logged. Atmospheric humidity was a very important factor. In connection with dissemination it was important to note

Intravenous quinine was next administered for four days, and the patient was discharged cured on the 25th day after admission.

Dr Yusuf comments on the extraordinary vitality shewn by the patient, and the surprising and gratifying outcome of the case. (Abstract from original communication)

Peripheral Irritation as a Cause of Asthma

DR. NIBARAN CHANDRA GHOSE, M.B., Hughly district, sends an account of a case of severe asthma of six months' duration in a Hindu male child aged twelve. The attacks came on especially after midnight. On examination the lungs were found to be normal but in the nose there was hyperplasia and catarrh of the mucosa over the right inferior turbinate. A collunarium of sodium bicarb was given, and the next day preparations were made for operation under local anaesthesia. Apothesine and adrenalin (P. D. & Co.) were sprayed on to the part with a de Vibris atomiser. Ten minutes later the swelling and oedema had become so much reduced that it was considered unnecessary to operate. A second apothesine-adrenalin application was made, and the patient given a similar solution to use as a collunarium for a week. He has subsequently been perfectly free from all symptoms of asthma. (Abstract from original communication)

Hysterical Dysphagia

DR. N. K. KURUP, L.M.F., Parassala, Travancore, sends an account of a case of hysterical dysphagia in a Hindu male adult of 51. The patient was brought to hospital on June 6th, 1922, with a history that he had been unable to swallow any food or fluid for three days. On giving him a glass of water he took it into his mouth but was unable to swallow it, although he apparently tried to do so. There was no history of dog-bite or other indication of hydrophobia also no history of any previous similar seizure. The onset was stated to have been sudden.

A stomach tube was passed without difficulty and 1½ pint of milk and rice water given, to the patient's great relief. Valerian was administered and the next day the patient, although unable to take food or drink, was able to sip medicine. A second feed was given by the stomach tube. On the third day he was able to swallow fluids, and in a week's time was able to take a full diet.

Hysterical dysphagia is very uncommon in the male, and Dr Kurup notes that the patient came from a remote village of the interior ten miles from hospital and seemed a neurasthenic subject of inferior mentality. (Abstract from original communication)

Symptoms Associated with Ascaris Infection

ASSISTANT SURGEON SASANKA SIKHAR DUTT, M.B., Madhubani, Darbhanga, sends an account of severe symptoms apparently due to *Ascaris* infection. The patient was a female child of 13, suffering from severe abdominal pain for some 14 days. For ten days she had appeared as if "overtaken by the ghost"—to quote her relatives' description,—with attacks of singing, crying, chattering and was at times violent. There had been complete constipation for three days when she was seen on the 15th day after the onset of symptoms. Opium had been administered by a compounder who had previously seen the patient and the relatives refused permission for an enema to be given. Sulphonal was administered and three doses of santonin were given in two days. Some twenty round worms were passed but none after a third dose of . . . In a week the patient had completely recovered. (Abstract from original communication)

Volatile Oils in Cholera Prophylaxis

DR. R. L. NAG, Bangeswardi, Faridpore, comments on the value of *Oleum eucalypti*, minim doses taken in tepid water or milk, for the prevention of cholera. He quotes instances of families in Faridpore who took this remedy during the prevalence of epidemics and escaped infection. As shewn by Lt-Col G. O. F. Sealy, R.M.S. (I.M.G., Dec., 1922, p. 474) the volatile oils appear to have a certain value in choleraic diarrhoea, and early in the treatment of cholera. (Abstract from original communication)

Fevers in Khondmals, Orissa.

DR. K. DALEPPA contributes an interesting note dealing with the fevers prevalent in this district. It is a large tract of jungle-covered mountains, consisting of four thanas, each provided with a dispensary. Malaria is the most important disease. Local spleen rates being 96 per cent. for Phulbani, Gochapara 95 per cent., Khajuripara 92 per cent., and Phringia 91 per cent.

Of local anophelines *A. nigerrimus* constituted 30 per cent., *A. fuliginosus* 27 per cent., *A. culicifacies* 18 per cent., and *A. listoni* 16 per cent. He notes that during three years' residence in the district he has seen two infants born with enlarged and palpable spleens both died a few days after birth. The prevalent types of malaria are malignant tertian and quotidian fevers.

Two interesting cases of malaria are appended to the report. One was a Hindu male of 47 years, who was admitted to hospital with a temperature of 104 degrees F. Quinine given by the mouth was not retained and the temperature rose to 105 degrees F. A cold pack and quinine enema were next tried. The temperature fell to 102 degrees after the third quinine enema and 5 grains of quinine bishydrochloride were then given intravenously in saline solution. After the first 24 hours of fever quinine given orally was still not retained, and quinine was continued by enema and intravenously. The patient had completely recovered on the 5th day after admission.

The second case was a male adult admitted with a temperature of 105 degrees, a tender liver, and passing frothy clay-coloured stools. There was also glycosuria. Quinine was given intramuscularly and by the 6th day in hospital the patient was well, and no sugar could be detected in the urine.

Dr Daleppa comments on the curious temperature charts shewn by both cases. The hot stage of the fever was prolonged, and in both, when the temperature had attained its highest point it subsequently dropped about a degree and then rose a second time, ending by rigor and crisis. Both cases were of very severe type, and the malaria of this district appears to be well worth study. (Abstract of original communication)

Oriental Sore in Kathiawar.

DR. P. T. KOTHARY, I.M.S., Chief Medical Officer, Junagadh, Kathiawar, records the occurrence of oriental sore in this district. Cases were seen in 1921, and in 1922, Lt-Col R. Row happened to visit the district in July and examined the cases microscopically and found *L. tropica*. The type of ulcer met with corresponds clinically in all respects to classical oriental sore, and is met with mostly on the face, cheeks, nose, forearm and legs. Both ulcerative and non-ulcerative types are met with. By way of treatment a local application of salol 1 dr., antimony oxide 3 grs., to olive oil 1 oz., was tried but in Dr Kothary's experience nothing short of scraping and carbolicisation does any good. The disease is apparently prevalent in the locality, although records prior to 1921 do not mention it. The true diagnosis having probably been missed. (Abstract from original communication)

Furunculosis with Mastoid Abscess.

DR K N PRADHAN, L M & S, Nagpur, records an interesting case of this condition. The patient was a Hindu male adult who had contracted influenza, followed by otitis media and fever. Air and bone conductivity were diminished and there was a tiny perforation of the membrana tympani. The auricle and external auditory meatus were sterilised and a paste of camphor, menthol and carbolic acid, equal parts, applied to the tympanic membrane through a speculum. The membrane was then incised freely, pus and blood drained off, and zinc ionisation applied for ten minutes.

Three days later the patient developed high fever, swelling of the tragus and cervical glands, and was unable to open his mouth. The auriculo-mastoid sulcus was obliterated and the auricle could not be touched. Two localised swellings were evident, one behind the tragus, the other in the posterior part of the external auditory canal. The middle ear was draining well but the local swellings were clearly furuncles and the patient refused further operation. He was now admitted to hospital.

A large pad of lint soaked with salicylate solution was placed on and around the auricle and attached to the negative pole of the electrolytic apparatus, the positive pole with a normal saline pad being applied to the arm of the same side. Fifteen minutes' ionisation completely relieved the pain and irritation. The ionisation was repeated daily. On the seventh day zinc solution and a zinc rod were used for the negative pole and on the ninth day faradism was tried. A week later the patient was in sound health with all local trouble completely relieved.

Dr Pradhan comments on the extraordinary relief of symptoms in this case immediately after ionisation was applied,—a relief which was more permanent and efficacious than even morphia could have given. Before the salicylate ionisation the patient could not admit an index finger into his mouth, but could do so immediately afterwards. The treatment appears to have been sound and efficacious. (*Abstract from original communication*)

Mycetoma Disease in Bihar.

DR DEVENDRANATH GHOSH, Medical Officer, Jamtara, Sontal Parganas, communicates a case of mycetoma infection of the right foot,—the first case of mycetoma infection which he has encountered in 24 years' service in Bihar. The patient gave a definite history of an abrasion to the sole of the foot from a stone followed by a localised swelling and abscess, with a second abscess in the ball of the foot a week later. The sinuses from these did not heal and by degrees the tissues of the foot became infiltrated.

When seen the case was of over two years' duration, and the foot swollen to four times its normal size. Amputation of the foot was considered inevitable and was carried out with long anterior and short posterior flaps through the upper third of the leg. The wound healed by first intention and the patient was discharged cured. The author asks for accounts of any incidence of mycetoma infection in Bihar to be reported, as the disease is very exceptional in this locality. (*Abstract from original communication*)

Insects and Disease.

THE January number of the *Indian Journal of Medical Research* is full of records of new work on "Insects and Disease."

First comes Lt-Col Cornwall who describes his technique for the examination of the minute anatomy of bed bugs and judging by the plates which he is enabled to shew, the methods must be very good. He has given a very clear picture of the salivary secretory mechanism and now the way is clearer for tracing

the cycle of development in the bug, of the *Leishmania* of kala-azar.

Lt-Col Christophers in continuation of a previous account of the development of the mosquito male generative organs has dealt with the same subject with regard to the female. He gives a minute anatomical description of the parts and outlines their autogenesis but unlike the case in the male these organs are not of much assistance in the identification of species. Later in the journal Christophers and Barraud address themselves to standardising a terminology for the male genitalia of the mosquito, which organs the researches of the former have shewn to be so important for classification. Turning to further mosquito work, Barraud appears with Part I of his "Revision of the Culicine mosquitoes of India" illustrated by a series of wonderful photographs and some rather unnecessarily large line-drawings. In this part the author disagrees with Edward's recent treatment of the Oriental Culicines in the course of which many well-known and hallowed genera have been sunk altogether or reduced to the grade of sub-genera. If indeed classification be of any importance at all, why should not the subdivision of groups be carried out to the bitter end as Barraud has carried it out? In this part we have the last word in description of the Indian *Stegomyia* and species of a new genus, *Christophersomyia*.

Dr Herst of Colombo relates the history of the discovery that *Xenopsylla astia* is not a plague flea, in fact that to a degree *B. pestis* has specific hosts, a rather unexpected denouement in the transmission of a bacillary disease. As Cragg has now pointed out, this species has a very patchy distribution and where it is present to the exclusion of our old friend *C. cheopis* plague is not endemic. One reason for this is that it will not readily bite man at temperatures of over 80 degrees. Another as stated, is that *B. pestis* has a specific relation to *Cheopis* and not to *astia* the bacillary 'pyloric stricture' occurs in both species but for some reason *astia* never behaves as a 'blocked' flea—it is impossible to produce plague by its bites.

Dr Senior White has investigated the mouth parts of the common eye-fly to test the assertion that it 'bites', especially as an allied genus in the West Indies has been incriminated with causing yaws by its bite. He finds that though it has no 'true' biting mouth, parts of the chitinous framework in its 'sucker' are differentiated sufficiently to enable it to scarify soft tissues such as the base of an ulcer—therefore it quite possibly does transmit yaws.

Major Shortt describes his technique for obtaining pure cultures of the natural *Herpetomonas* of the common dog flea and the effect of unnatural environment on this parasite. He finds that the "post-flagellate form" flagellates in the gut of the bed bug and concludes that the flagellation of kala-azar bodies under the same influence does not connote the specificity of the bed bug in the development of the parasite. He also found that the production of "thick tails" from flea *Herpetomonas* in contact with the teased gut of the bed bug was just as easily produced as from the kala-azar bodies. Of course it is presumed that *H. ctenocephali* has no connection with kala-azar.

Major Sinton gives a description of a new *Phlebotomus* to be named *annandalei* and his paper emphasises the great difficulty of determining females of *Phlebotomus* species. Altogether a galaxy of important papers.

C A STRICKLAND

A Remarkable Mosquito, *Opifex Fuscus*, Hutton.

By DAVID MILLER, F.R.S.,

Bull Ent Res May, 1922, p 115

FROM New Zealand, that land of the Apteryx, the Moa and the Dodo comes this report of another quaint creature a mosquito which breeds in brackish pools on the lovely rocky coast.

It is important from the point of view of its morphology because of this it cannot be boarded out in any of the old established families, the Anophelines, Culicines, Megarrhines, and Sabethines, for its proboscis is slightly curved and its male antennæ not plumose, it has to be relegated to another home, the family *Opificinæ* proposed for it by the author

Yaws in Burma

DR. S. C. SEN, Sandoway, Burma, supplies notes on five cases of yaws occurring more or less simultaneously in the same family in this district. It is clear that the existence of yaws in Burma cannot be denied, whilst the disease is also encountered in Assam, and is even prevalent in such tracts as the Kuki Hills. In Burma, frambœsia is probably frequently mistaken for syphilis.

The cases consisted of a father with his two sons and two daughters the father having been the first to contract the infection. Dr. Shwe Ge, L.M.S., is stated to have seen this yaws family some years previously and also to have come across eight other cases in two other villages in the same district in the Arrakan Division, in 1918. The cases were treated with potassium iodide and mercury internally plus local applications of copper sulphate solution, 20 grains to the ounce. The latter gave very encouraging results. Finally arsenobillon injections were given intravenously at seven-day intervals and the cases cleared up. The author comments on the special tendency to familial distribution in frambœsia, a marked feature of the epidemiology of the disease (*Abstract from original communication*).

Some Operations of General Practice

THE January 1923 number of the *Practitioner* is a special number in which appear a number of exceedingly valuable articles on "Some operations of General Practice." The abstracts which we give will probably be of general interest, but the articles should be read in their original form.

In an introductory note Sir Arthur Mayo-Robson points out that every medical man engaged in general practice should be able to perform any of the ordinary operations required in surgical emergencies, many of which are described under the various sections in this useful volume.

OPHTHALMIC OPERATIONS

Sir Anderson Critchett deals with ophthalmic surgery from the point of view of the general practitioner. He advises the practitioner who is consulted with reference to an inflamed eye to make careful search for a foreign body, or for an ingrowing eyelash. Failure to do this may cause a more observant rival to score, and the patient to blaspheme. "A powerful magnifying lens should be used, and every portion of the cornea be brought plainly into view by oblique illumination. If nothing is found there, the upper lid should be everted and the palpebral conjunctiva thoroughly examined. Occasionally the source of irritation may be traced to a vagrant lash, which has found its way into the punctum. For everting the upper lid he advises the use of a glass rod or a probe with which gentle pressure is made just above the margin of the cartilage with the right hand while the lashes are grasped by the forefinger and thumb of the left hand, and a rapid turning movement is easily effected. For lifting foreign bodies from the cornea a round-ended spud should be employed, and care must be taken to remove as little as possible of the corneal epithelium. Unless the patient is exceptionally insensitive, it is always well to apply cocaine, and if the cornea has been unavoidably abraded a drop of castor oil should be inserted between the lids.

Another useful operation which general practitioners may legitimately do is the removal of tarsal cysts.

These troublesome little excrescences may sometimes in an early stage be made to disappear by the use of a

mild mercurial ointment and massage, but when operative measures have become necessary a cyst in the upper lid should be dealt with by a crucial incision through the cartilage, and, after the contents have been evacuated with a small spoon-ended probe, or best of all with a Volkmann's spoon, the cyst wall must be thoroughly removed by firm scraping.

Defects in the lachrymal apparatus, though seldom serious, are often very troublesome. If the trouble amounts to little more than occasional watering of the eyes in cold weather, the complainant may be advised to bear it. When the condition is more serious, especially if gentle pressure on the lachrymal sac brings some muco-purulent fluid up through the punctum, it may be necessary to enlarge the canaliculus gently and gradually with Nettleship's dilator, and syringe out the sac once or twice a week with boric acid lotion, but the slitting of the canaliculus and passing of probes, always a debatable method of treatment, should in the author's view, not be attempted by the general practitioner. If there is an abscess of the sac, it must be incised.

Hordeola (styes) usually effect their own cure, but this may sometimes be hastened by the removal of an eyelash when the swelling is coming to a head. Every practitioner should know how to perform enucleation—the knowledge when to resort to it is a more difficult and responsible matter. Attention is called to a valuable discovery made by Sir William Lister during his responsible work in the war. He found that in all cases in which there was a septic element the optic nerve should not be divided behind the globe but that a small rim or fringe of sclerotic should be left. By this simple proceeding the risk of meningitis and kindred troubles was lessened materially.

THROAT, NOSE AND EAR.

Sir James Dundas-Grant discusses conditions of the throat, nose and ear on the same lines. In connection with the throat, threatened asphyxia is indicated by laryngeal stridor accompanied by violent "excursions" of the larynx with each breath, insuption of the supra-clavicular spaces, increasing cyanosis, and a struggle for breath and life. If the suffocation has come on from the impaction of a lump of food during a meal, it may be justifiable to endeavour to dislodge this by means of the finger, but no time should be lost if the asphyxia is threatening.

The simplest operation for laryngeal obstruction is "laryngotomy." A vertical incision is made in the middle line over the thyroid and cricoid cartilages, the soft parts are retracted and a sharp pointed director is forced through the crico-thyroid membrane. A second one is pushed through alongside this, and an ordinary tracheal dilator, preferably Butlin's perforating one, is introduced between them. A flattened trachea cannula or short flat tracheotomy tube is then introduced, and the tapes attached to its collar are tied round the neck. This is the ideal laryngotomy when the danger of asphyxia is not too pressing. The operation has more often to be carried out by pinching up the skin, transfixing it with a sharp pointed bistoury and cutting outwards, then stabbing through the crico-thyroid membrane horizontally, close above the cricoid ring and introducing a tube on a pilot. In the absence of the standard tube, the lips of the opening may be kept open by means of two hairpins bent so as to form retractors, a large quill, a catheter or a piece of drainage tube, until the crisis is over.

The operation of choice in the child is that of high tracheotomy. When the symptoms are urgent, the operation should be carried out at once as follows—

The surgeon stands on the right side of the patient. He fixes the larynx by means of the thumb and middle finger of the left hand, localizes the lower margin of the cricoid cartilage with the tip of the index finger. He then makes an incision in the median line downwards from this index finger of at least an inch in length, cuts up and down through the cellular tissue and aponeurosis. He now introduces the index finger into the wound and with it pulls the cricoid upwards, punctures the trachea boldly with the point of the bistoury,

the back touching the finger nail, and when the air enters the puncture with a whistling noise and some blood is coughed out, he divides the trachea from above downwards through two or three rings, the finger following the blade downwards. The cannula is now introduced either directly by means of the pilot guide or after the introduction of the tracheal dilator.

If there is time for *deliberate tracheotomy* it should be carried out in the recognized way.

A *retro-pharyngeal* abscess bulges into the back of the pharynx so as to interfere with respiration and deglutition, but the danger attaching to it is that of spontaneous rupture and the entrance of pus into the trachea, especially if the rupture occurs during sleep. In the adult an incision is made into the swelling with the patient sitting up. A curved sharp pointed bistoury with the nearer part of the blade wrapped in cotton-wool, may be used. The patient bends forward and hawks the pus out into a basin. A little iodoform emulsion in glycerine may then be injected by means of an ordinary glass syringe. An infant should be wrapped in a blanket, laid on its back with the head hanging down so that light may fall into the back of the throat. The tongue must be held up by means of a spatula. The incision is made into the centre or the most bulging part of the swelling, and the patient is then quickly turned over on its front with the head dependent so that the pus may run out of the mouth and not into the larynx. It is well to assure one's self that the abscess is not connected with tuberculous disease of the spine.

Peritonsillar abscess or *quinsy* is generally speaking a collection of pus, not in the tonsil, but in the tonsil's "bed." The incision for its evacuation must, therefore, not be made into the tonsil but into the bulging to the outer side and slightly above it. The point for puncturing is at the centre of a line running from the base of the uvula to the last upper molar and the cut (made with a curved sharp pointed bistoury) should run downwards and slightly outwards.

Epistaxis almost invariably arises from rupture of small vessels on the lower and anterior part of the septum, within easy reach of the eye and of the probe. It must be remembered that epistaxis is often a manifestation of high arterial tension and a relief rather than a danger. Too great zeal should not be exercised in stopping the hæmorrhage in such cases.

Of all the operations which by timely performance give immunity from serious disability and danger, there is probably none more important than *paracentesis of the tympanic membrane* for acute suppurative inflammation in the middle ear. The practitioner should, therefore, be prepared to carry it out without delay. The indications are extreme pain, feverishness, and deafness (not to be accounted for by a swelling in the meatus such as furuncle) and of such severity as to prevent sleep for one or two nights. These symptoms indicate the need for puncture or incision of the membrane. The appearance of the tympanic membrane is usually that of a puffy red swelling, the malleus and other distinctive features being lost and merged in the general congestion and tumefaction. If the lie of the membrane can be identified, the postero-inferior quadrant is opened by a curved slit made with a fine sharp myringotome or a tenotome or Graefe cataract knife—entering below and cutting upwards or by preference, if possible, curving backwards and upwards parallel to the posterior wall of the meatus.

All should be done under the guidance of the eye with well directed light, but in actual practice it may often be necessary to trust to groping along the floor and back wall of the meatus and pushing the point of the knife through the membrane till it touches the inner wall of the tympanum. The most likely error is that of striking the posterior wall of the meatus and coming to a dead stop. The point of the knife should then be disengaged and directed more anteriorly, and then again pushed through the membrane with every probability of success. Preliminary sterilization of the parts has probably been effected to a considerable degree by the antiseptic drops usually employed in the treatment of the disease but before operation the auricle should be washed and then scrubbed with biniodide in spirit. This

should also be painted well into the walls of the meatus short of the deepest part of that passage.

After the incision, the meatus should be gently swabbed with a twist of sterilized absorbent cotton-wool or gauze after the patient, if awake, has "blown through" the ear. A general anæsthetic is desirable, and nitrous oxide gas usually suffices, but much may be done with a local one and a fine pledget of cotton-wool.

The mastoid operations which the practitioner may have to deal with on the spot are the acute suppurations extending from the middle ear to the "mastoid cells" and usually resulting from acute catarrh, influenza, or the exanthemata. In these the suppurating cells are generally large and superficial. Even if the practitioner deals with such cases only, he may prevent much disease and save some lives.

CERTAIN SURGICAL EMERGENCIES, WITH SPECIAL REFERENCE TO THE ABDOMINAL REGION

Sir D'Arcy Power deals with certain surgical emergencies, with special reference to the abdominal region. He points out that *Cut Wrist* is one of the commoner accidents met with in general practice, and is one of the most likely to be followed by disastrous results unless care is taken to suture tendon to tendon and nerve to nerve. Too often a cut tendon is joined to a divided nerve, or the tendons are united and the nerves are neglected. There is no difficulty in recognizing the greyish-white, linearly striated trunk of the ulnar or median nerve from the dead white and retracted tendons. A tourniquet should be applied to the arm, the wound enlarged, the divided ends demonstrated and sutured methodically like to like.

His method of dealing with *Retropharyngeal Abscess* occurring in babies, is to open externally by making a one inch incision, beginning an inch below the mastoid process and immediately behind the posterior border of the sternomastoid. The knife is laid aside as soon as the deep fascia has been divided, and the abscess is opened with a blunt pointed director, one finger being kept in the mouth, touching the back wall of the pharynx. The abscess is readily emptied by pressure exercised through the pharynx.

Secondary Hæmorrhage is often a grave surgical emergency. It only occurs in septic wounds. It comes on without warning, and time is wasted in palliative treatment in the hope that it will not recur. Palliative treatment such as the application of a lotion at a temperature of 125° F may be tried but if the bleeding recurs, and it is from a large vessel, do not wait until the patient is reduced to the last extremity, but ligature the main artery and do not attempt to tie the bleeding point on the face of a septic stump.

Acute retention due to stricture is often very difficult to treat, and in the spasmodic forms half the battle consists in gaining the confidence of the patient, so that he will allow the catheter to be passed on steadily and uninterruptedly. A hot bath and the administration of 20 minims of tinct opii should be tried before speaking of the necessity of catheterization. Suprapubic puncture must be done when it is impossible to pass a catheter, care being taken to use a fine and long needle, for if an ordinary trocar and canula be employed there is some danger of the bladder contracting away from the canula as it empties itself, and thus allowing extravasation of urine into the pelvic tissues. The incisions should be free because as the swelling subsides the incisions shorten. It is quite unnecessary to put in a catheter, for the urine drains away through the ulcerated urethra.

Strangulated hernia is always an emergency of the first order. The difficult cases are those in which, from a variety of causes, neither a general nor a local anæsthetic can be given. Experience has shown that in such cases the simple relief of strangulation can be done rapidly and without undue pain in a fully conscious patient.

The really serious emergencies are those which occur in connection with "the acute abdomen." The sooner the condition is recognised and an operation for it

relief is undertaken, the more likely is the patient to survive

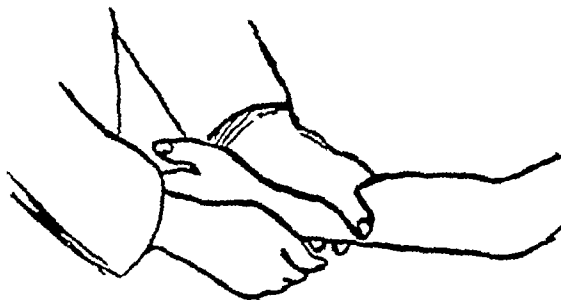
Acute duodenal perforation is likely to be overlooked for a time when it occurs in its most acute form, because the collapse soon passes off and the patient appears to be improving. The sudden onset in a man who has considered himself to be in perfectly good health, the absence of any history of severe indigestion, the great pain, the intense shock, and the general aspect of the patient, should afford evidence even before the abdomen becomes rigid. The shock, soon passes off, but as it does so the rigidity of the abdomen becomes a definite feature, together with the pain referred to the right iliac fossa, and the local tenderness above and to the right of the umbilicus. Immediate operation affords the only chance of recovery.

Acute gastric perforation also occurs suddenly in women as well as in men, but the onset is less unexpected than in perforation of the duodenum, as there is a history of previous indigestion or of treatment for a gastric ulcer. The pain, too, is more diffused, and there is not the same amelioration of symptoms when the shock of the perforation has passed off, as occurs in acute duodenal perforation.

BONES AND JOINTS

The surgery of bones and joints is discussed by Sir John Lynn-Thomas. He begins by stating that X-ray photographs are very rarely required, and do not materially assist in the art of setting fractures. A measuring tape and a trained sense of touch are infinitely more important.

When the measuring tape indicates inches of shortening of the femur, the only way to restore normal length is by immediate extension, which may require hundreds of pounds' pull, and when restored the limb should be fixed in a Thomas's splint after the Liverpool School fashion. Open operations are to be condemned except perhaps in the hands of those experienced in such work. When a limb has to be encased in a splint, its shape should conform to the outline. Flat wooden splints should be discarded and should be replaced by "gutter" splints made of metal, light but strong enough to meet all the stresses splints are subjected to. By using the gutter-shaped splint the most complicated cases can be dealt with. Gutter splints for the forearm must not only be strong enough to meet the longitudinal stresses but pliable enough to be moulded to the forearm by a slight spiral twist to the right or left to maintain pronation. There is only one right way of reducing and splinting a Colles' Fracture.



(Robert Jones method)

REDUCING A COLLES' FRACTURE.

"The surgeon with his left hand, palm upwards, grasps the patient's left arm placing the tubercle of his own scaphoid against the projecting lower end of the upper fragment, he then places his right hand, palm downwards, with the tuberosity of the scaphoid on the upper edge of the lower fragment, when, by a forcible pressure, the fragments are properly replaced in position and crepitus is often felt. If the reduction is complete, the patient can at once move his fingers with less difficulty than before."

Fractures of the base of the skull call for antiseptic treatment. The ears and auditory meatuses, fingers including nails, the nostrils and lips are immediately covered with tinct iodi, and later on treated with medicated vaseline, the bed-clothes are covered with sterile towels, which again are dusted with boric acid powder, as well as the hair, face and everything else within reach of the restless hands. The nostrils and mouth are sprayed as often as opportunity arises.

Joints receiving injuries are, as a rule, left too long to look after themselves, with the result that adhesions form without and, more rarely, within the joint. A very useful way of breaking down some adhesions of the shoulder is to go through the manipulations recommended for reduction of dislocation of the shoulder by Kocher's method, it is not always enough, because at times they are only broken down at full abduction, and that can best be done either by circumduction or by the foot-in-the-axilla method, whilst operating at almost right angles to the affected shoulder.

It is wise and advisable to get a radiograph taken to see whether there are hidden fractures of the humerus before starting forcible movement.

In all joints, forcible manipulations should be done thoroughly once and once only, then leave well done. A series of half-hearted attempts at manipulation brings additional effusion around a crippled joint.

It is advisable in stiff elbows to give an anæsthetic. The forearm must be fully supinated and pronated, then fully extended and finally flexed to the full and held to the neck with strapping for a few days' rest, unless mobility is quite free and practically painless, when the patient is allowed to use it.

For dislocation of the shoulder the best method for general use is the misnamed heel-in-the-axilla method. "Foot-in-the-axilla" is a more appropriate name. The author uses both feet, they form an expansile intelligent crutch. For reduction of the left shoulder the right foot is resting on the left and has the instep facing the chest, the position is reversed for reducing the right shoulder. The top foot forms an excellent crutch for counter extension, whilst the toes are freely mobile to assist in "manipulating" the head into the glenoid cavity.

Complete and incomplete fractures of the upper end of the humerus are frequently associated with dislocation. In these very serious cases the foot-in-the-axilla method gives a better chance of reducing dislocation than any other method.

The use of Kocher's method of reduction may result in fracturing the humerus at the moment of reduction.

THE RECTUM

In discussing the rectum Sir C Gordon Watson points out that the use of a tubular speculum with a light attached is a most valuable aid to diagnosis, that the genu-pectoral position (in the male) renders examination by inspection much more easy, and that digital and bi-digital examination become increasingly valuable with constant practice.

The choice of operation for hæmorrhoids must depend to some extent on the experience of the operator as well as on the circumstances of the case. The ligature operation is, perhaps, the most suitable for all-round use. The clamp and cautery is followed by less pain, but it is not, perhaps, so suitable for extensive hæmorrhoids as ligature. Minor cases can be effectively dealt with by the method of carbolic acid injection which produces thrombosis, but the risks attendant on thrombosis introduce an element of uncertainty. Pain after operation can often be minimised, if not eliminated, by avoiding undue stretching of the sphincter by liberal incisions at the muco-cutaneous junction so that only the hæmorrhoidal vessels with the overlying mucosa are included in the ligature, by removal of all redundant skin to avoid oedematous tags, by strict attention to asepsis so that post-operative inflammation is reduced to a minimum and by adequate preparation of the bowel beforehand, and careful dieting afterwards to avoid flatulent distension.

Castor oil should be given two nights before operation, followed by a saline mixture in the morning. The evening before operation an enema should be given, and should be repeated if the returning fluid is not clear. Immediately after the enema a mixture containing a drachm of catechu and 10 min of tinct. opii is given, and on the morning of the operation, quite early, another dose of catechu mixture is given, and followed half an hour before operation by a hypodermic injection of $1\frac{1}{6}$ grain of morphia and $1\frac{1}{120}$ of atropine. No solid food is given on the day preceding operation. At the end of the operation an ounce of vaseline is squeezed into the rectum, and a small tube ($\frac{1}{4}$ -inch diameter) inserted. The first day after operation diet is restricted to fluids, but on the following day ordinary light diet is employed.

The tube is left in for three days, unless the patient complains of it. It helps to keep down tags. If there is difficulty with micturition, the tube may be removed. The surface dressing is renewed on the first day, and on the second day all dressings are changed, and the area is irrigated with peroxide, wool rinsed out in 1 in 2,000 bismuthide of mercury is used for the dressing. On the evening of the third day five ounces of warm olive oil are slowly injected into the rectum, and on the morning of the fourth day an ounce of castor oil is given. The patient may be allowed up and out on the 12th to the 14th day after ligature.

The treatment of hæmorrhoids by injections of carbolic acid in selected patients, especially those who are much inconvenienced by a minor degree of hæmorrhoids and who are unable to afford either the time or expense necessary to undergo an operation, or are unsuitable for a general anæsthetic, is valuable. If the method is employed, strict attention to detail is essential. A 20 per cent solution of carbolic acid in equal parts of glycerine and water is usually employed. A short proctoscope is inserted and gradually withdrawn until the piles prolapse within the lumen. After swabbing with spirit a few minims (not more than five) of the solution are slowly injected into the centre of one or two (at most three) of the hæmorrhoids. If prolapse occurs after injection, the piles must be returned at once to avoid strangulation and sloughing.

It is usually claimed that patients can safely continue their occupation, if not strenuous, after the injection, but it is wiser to recommend the patient to lie up for two days after injection. The practitioner will also be on safer ground if he is content to treat one hæmorrhoid at a time.

The Inflamed and Thrombosed External Hæmorrhoid—The pain and discomfort, especially on defæcation, can be dealt with very simply.

The treatment consists in turning out the clot after incision and then cutting off the overhanging edges of skin. This can be done painlessly after injecting a few minims of a 1 per cent solution of novocaine, or after spraying with ethyl chloride. With strict attention to cleanliness no further trouble need be expected. Pain is relieved at once and healing occurs rapidly.

Fissure in Ano—The pain of a fissure is out of all proportion to the gravity of the malady.

Attempts to cure any but recent and slight fissures by palliative means are usually ineffectual, or give but temporary relief. The only certain method of cure is by incision of the external sphincter, so as to put the muscle out of action until the fissured area has healed. Simple stretching of the sphincter in slight cases may suffice, if care is taken to avoid hard motions. When incising the sphincter it is important to cut out through the skin well beyond the anal margin, removing the œdematous tag of skin, "the sentinel pile," which is usually present. A lozenge-shaped wound results after the overhanging edges have been cut away, this is allowed to granulate up from the bottom.

It often happens that patients are unwilling or unable to lie up and submit to operation. In these cases, relief, and sometimes cure, may be secured by using a fine electric cautery to cut through the base of the fissure under local anæsthesia. Fissures are very liable to recur

unless constipation, which is the usual cause, is carefully avoided after operation.

Fistula in ano is perhaps the most neglected disease in existence. It can be cured with certainty, by experienced surgeons. Operations for fistula in ano in general practice more often than not will fail to enhance the reputation of the practitioner as a surgeon.

GYNÆCOLOGY AND OBSTETRICS

In dealing with the operations of Gynæcology and Obstetrics which may be performed by the general practitioner Dr Comyns Berkeley begins by saying "From the uterine curette and the obstetric forceps, good Lord deliver us." Such diseases as chronic endometritis, mucous polypi, subinvolution with or without retained products and leucorrhœa, are rightly and successfully treated by curetting. On the other hand curetting is quite frequently performed for cases in which, if the practitioner had made a thorough examination, fibroid tumours of the uterus, fibrosis of the uterus, fixed retroversion of the uterus, or diseased uterine appendages would have been found in these the operation must be a failure. The operation is commonly and uselessly performed for symptoms in association with which no abnormality can be discovered on local examination, such as congestive dysmenorrhœa, excessive hæmorrhage, and some cases of sterility, through ignorance of the pathological condition, whilst, in many cases the operation is inefficiently performed with disappointing results as in the case of leucorrhœa.

The operation is often performed in cases of sterility in which the practitioner has failed to prove that the husband is not at fault. Yet an examination of the husband's seminal fluid can be made with very little trouble. If the husband has coitus in the morning with the aid of a condom, and the imprisoned seminal fluid is then wrapped round with cotton wool and sent at once to be examined microscopically, and the secretion is placed on a warm stage, there is very little chance of the spermatozoa dying before they are examined. As it is calculated that in at least 10 per cent of cases the fault lies with the husband, it must be admitted that it is almost criminal to subject a woman to the discomfort, dangers, and expense of a curetting before an examination of the semen of her husband has shown that the spermatozoa are healthy.

Curetting in cases of leucorrhœa is often unsatisfactory. In the operation of curetting the thin mucous membrane of the cervix that is very firmly attached to the muscle is often ignored, and as the seat of the disease is situated in the mucous membrane of the cervix, removing that of the body will do no good at all. What really needs attention is the diseased mucous membrane of the cervix, and the erosion, if present, and these should be scraped with a sharp spoon used vigorously.

ANTISEPTICS IN COMMON OPERATIONS

Dr W E Dixon discusses Antiseptics in Common Operations. Carbolic acid is stable, penetrates lipoids very readily and has some germicidal action, it is irritant, perhaps by virtue of its property of precipitating proteins, it inhibits the formation of granulation tissue and if absorbed is poisonous, a 2 per cent poultice applied to the skin too long leads to local gangrene. Phenol for antiseptic purposes should be dissolved in water, glycerine, alcohol, and especially oil detract from its antiseptic action.

The creosols have a phenol co-efficient of 3 or 4, and are less toxic to body tissues than phenol, they are usually brought into solution by soft soap.

Chlorine derivatives have become very popular as antiseptics especially in the treatment of infected wounds. They have much to recommend them, they are non-poisonous, have little irritant action, and hardly effect leucocytes, they are powerful oxidizing agents and destroy toxins, and it has been noted frequently that the free application of these derivatives to infected wounds causes constitutional symptoms to disappear, though only to return when the treatment is stopped.

Hypochlorites in solution kill most pyogenic organisms in serum in a concentration of 1 in 1,500. Blood when present decomposes the hypochlorites, so that as much as 1 in 300 may now be required to effect sterilization. Sodium hypochlorite solution is especially valuable for cleansing septic wounds, but, unfortunately, it quickly loses its action and requires frequent renewal, for the available chlorine disappears, it has the additional advantages that it dissolves necrosed tissues, is non-poisonous and cheap. These solutions are certainly more irritant to the skin than to the deeper tissues, and some care is required when the application is continuous.

Chloramine T is readily soluble in water and, like the hypochlorites, attacks metals. In equi-molecular solutions it is less irritant and about four times as efficient a germicide as hypochlorite. It disinfects very rapidly, the maximum effect being reached a few minutes after application. For the treatment of wounds it is best employed as a 2 per cent. solution, and the action gradually disappears as the available chlorine is used up and more rapidly if septic conditions obtain. A 5 per cent. gauze is suitable for packing septic cavities. It is especially valuable for the treatment of infected wounds and, on account of the absence of irritation, for injuries to the mouth and jaw. Ointments made with these substances are inert.

Mercuric potassium iodide (bimiodide) is less irritant than the chloride, but otherwise closely resembles it. Perchloride should be used with care in situations where absorption is likely to occur, even douching the vagina with dilute solutions has led to poisoning. It is now used principally to disinfect the hands, it preserves its disinfectant properties in oils and fats, but loses much of its effect in the presence of common salt.

Dyes and allied drugs have hardly fulfilled the high expectations anticipated for them.

All the flavines are powerful antiseptics, and have been used in the prophylactic treatment of wounds as well as in suppuration, they are said to be especially useful for the nasopharynx and for washing out cavities. Their value in surgery has yet to be determined.

Hydrogen peroxide is of little value as a germicide, its action is due to the fact that blood, pus and tissue proteins decompose it with the evolution of oxygen and the mechanical action of the liberated gas removes sticky adhesions and washes away pus. Permanganates, also oxidizing agents, are chiefly used for irrigation, they are mild germicides when no serum or pus is present, and are unsuitable for septic wound treatment. Iodine has much to recommend it, for disinfecting the skin a 2 or 3 per cent. in alcohol acts admirably, but for wounds it is too irritating, and after constant use severe after effects, such as neuritis, have been observed. Borates, perborates, and boric acid are only useful to prevent the growth of putrefactive organisms, they are not germicides.

Iodoform owes its action to the gradual liberation of iodine in the presence of proteins, and this stimulates the growth of granulation tissue, it has no germicidal properties.

A quinine derivative iso-octylhydrocupreine (vuzin) kills streptococci in strengths of 1 in 80,000, and heptylhydrocupreine kills staphylococci in such dilutions as 1 in 64,000. Many laudatory reviews of these substances have been published from the clinics in Germany, but in this country they are almost untried.

Dr. Dixon concludes by saying that "No antiseptic can be regarded as the best, each has its special use, many are irritant, most are much weakened by the presence of protein, some are toxic after absorption, and some have special affinities for certain micro-organisms. Few can doubt that the future of surgery in this respect lies in the laboratories of chemistry and pharmacology."

A Year Book of Treatment, 1922

THE January, 1923, number of *The Prescriber*—issued at 4½—forms a very complete and full card index and precise summary of the work of 1922 on the etiology

and treatment of the more important diseases met with in general medical practice, including tropical diseases and affections of the skin. The number is very complete the papers referred to are well reviewed and summarised, and the whole constitutes a useful and reliable guide to present-day therapy. The offices are at No 6, South Charlotte Street, Edinburgh.

Splenectomy.

By R. P. ROWLANDS, M.S., F.R.C.S.,
Guy's Hospital Gazette, 23rd December, 1922, p. 513.

MR ROWLANDS' clinical lecture will be read with interest in India. Dealing with the history of splenectomy he relates that Zaccarello in 1549 was the first person to successfully remove the spleen,—his assistant having previously gone to the Justices to give the patient up for dead, as was apparently usually done in severe surgical cases. In the 17th century Matthias was called to a case of wound of the abdomen with protrusion of the spleen. It was then held that life would be impossible without the spleen, and he proceeded to do splenectomy with great trepidation. The patient, however, survived. In 1676 Clarke of Somerset removed a spleen which had prolapsed through an abdominal wound, and also carried out the first experimental splenectomy on a dog. In 1669 Malpighi ligatured the splenic artery in a dog. In 1866 Spencer Wells first performed splenectomy for an enlarged spleen. Bryant in 1866 and 1867 performed two splenectomies for splenomedullary leukaemia both patients died from hæmorrhage, and he concluded that the procedure was both unsound and unsafe in this condition.

Mr Rowlands' cases were—(a) a middle-aged woman suffering from pernicious anaemia. Operation was easy, the patient stood it well, and shewed subsequent great improvement in the blood condition, (b) a young man suffering from splenic anaemia. Operation was very difficult owing to adhesions, an abscess subsequently developed in the flank and thrombosis of the right axillary vein. The indications which he gives for splenectomy are—

(1) Ruptured spleen.—In this connection he quotes a remarkable case of a young woman with a ruptured spleen admitted to "Barts." No explanation of the condition could be found except that she had been taken for a walk by a soldier who had put his arm round her and squeezed her. In operating the essential step is to disregard everything else, and the instant the abdomen is opened to pass the hand to the pedicle and seize, clamp, and ligature it.

(2) Wandering spleen with twisted pedicle.
(3) Cysts,—hydatid, blood, serous, lymphatic, and dermoid. A case of false aneurism of the spleen following a blow with a football is recorded. The operation may be difficult from adhesions.

(4) Splenic anaemia, "the only satisfactory treatment" and one which should not be delayed. The Mayo clinic record 71 splenectomies for this condition with a mortality of 12.6 per cent. The special post-operative dangers in this condition are sepsis, to which the patient is very susceptible, thrombosis of the splenic vein spreading to the superior mesenteric and portal veins, and a special tendency to hæmorrhage, especially to hæmatemesis.

(5) Hæmolytic jaundice, especially of the acquired and not familial type, and associated with increased fragility of the red corpuscles. The results are often exceedingly good.

(6) Tropical splenomegaly. Here it would be of interest to hear of results in kala-azar and malaria.

(7) Syphilitic splenomegaly (a condition which is far from uncommon in India, and which appears to be less often congenital and more frequently acquired in this country than in Europe).

(8) Occasionally in tuberculosis if limited to the spleen. The Mayo clinic record four such splenectomies with successful results.

(9) Pernicious anaemia. Here opinion as to the value of splenectomy is divided. A recent analysis by

Giffin and Szlapka of the end results in 50 such splenectomised cases of this disease shews that 21.3 per cent of the cases lived for three years or more, and that 10.6 per cent were living five years after the operation. "In at least one-third of the cases the average life of the patients with pernicious anæmia is greatly prolonged and in about 10 per cent the prolongation is sufficient to lead to the hope that cures may result in some cases."

(10) Gaucher's disease, endothelioma of the spleen. Other indications are septic spleen, abscess of the spleen, and aneurism of the splenic artery.

Splenectomy is an operation of special interest in India and it would be of special interest to obtain particulars of cases and indications under tropical conditions. A patient who has been in two or more of the Calcutta hospitals during the last three years is an Indian male adult with a spleen reaching to the right iliac fossa. He is most anxious to have splenectomy performed, but hitherto no surgeon has been found who is willing to carry out the operation. The case, although clinically diagnosed as kala-azar, is almost certainly one of old standing malaria as spleen puncture has repeatedly failed to give positive findings. Numerous adhesions are probably present.

ANNUAL REPORTS.

TRIENNIAL CLINICAL REPORT OF THE GOVERNMENT MATERNITY HOSPITAL, MADRAS, FOR THE YEARS 1919-21

THIS report is one which will be of interest to all general practitioners. The tables given in it deal with such important matters as the puerperal and non-puerperal causes of death, results with different modes of treatment and in different classes of patients, primiparæ and multiparæ, in eclampsia, classification of obstetric cases and operations, analyses of classes of labour, indications for and results in forceps operations, etc. The report ends with the following notes by Major C. A. F. Hingston, I.M.S., which are of such interest that we give them *in extenso*—

"There are a large number of interesting cases seen in this hospital every year in the gynæcological and maternity sides. The practice of this hospital is in some ways quite an original one, not to be found in text-books. We are quite sure that it will pay graduates to come here for a month or two whenever they get leave to do so.

"The following are only a few of the interesting points in the practice of this hospital—

"During the last three years this hospital has taken a distinct lead in the treatment of eclampsia. The staff here are quite convinced of the importance of recording the blood pressure in all cases of eclampsia and threatened eclampsia and keeping the blood pressure reduced, before and after confinement to 120 mm. and during the confinement to about 90 mm. We are now making a careful study as to the best means of reducing blood pressure in pregnant women before, during and after confinement. Very good results have been obtained in a series of cases in which venesection was done. We are now giving veratrine hypodermically a good trial in a series of cases. Results with both these methods are distinctly good. Compared with former years when other methods of treatment were adopted our results are much better now.

"Spirit ammonia aromaticus inhalations given to a patient who has been under chloroform prevents vomiting after chloroform administration. We generally give inhalations of spirit ammonia aromat for about 10 to 15 minutes.

"We think leaving a tent in the cervix for 48 hours is better than leaving it for 24 hours, whenever a tent is used for dilating the cervix.

"We are great believers in the treatment of amenorrhœa and scanty periods by half drachm doses of syrup ferri iodid three times a day after food, iodic

(B. W. Co's) tabloids given three times a day, or iodic injections. We believe that the mucous membrane of the uterus has the power of picking out iodine from the blood and when a woman has accumulated sufficient iodine she menstruates.

"We have found in our practice patients greatly benefited by the mixed gland female tabloids of B. W. Co's if given to patients after hysterectomy and during the menopause when patients are complaining of symptoms.

"We are still believers in ventral fixation for a retroverted or a prolapsed uterus in cases where women are unable to become pregnant owing to the displacement of the uterus. We practise Bonney's method of shortening the round ligaments of the uterus, but we find results after fixation, which is a very simple operation, just as good.

"The technique in the operation theatre has been improved in the last few years. We are glad to see large numbers of post-graduates coming here to study our methods. This hospital undoubtedly is becoming a great centre for post-graduate work.

"During the last eighteen months 50 junior I.M.S. officers have passed through post-graduate courses and a very large number of graduates from all over India have attended the practice of this hospital.

"We hope General Giffard's clinical lectures, showing the practice of the obstetrical side of the hospital which he carefully elaborated while he was here as Superintendent and which we continue to practise, will be published at an early date.

"We propose to issue at a very early date gleanings from the records of the Government Maternity Hospital."

ANNUAL ADMINISTRATION REPORT. ASANSOL MINES' BOARD OF HEALTH 1921-22.

DR J. W. Tomb's vigorous work on behalf of the improved health of the Asansol mining community is well known, and his report for 1921-22 is an interesting one. The appreciation with which the Government of Bengal view his services is shewn by their having recently renewed his contract for a further term of five years.

During the year the number of inspection circles was increased from 5 to 6. The year was remarkably free from malaria. Small-pox shewed a satisfactory diminution, and vaccination was readily accepted by the population concerned. The degree of protection by vaccination afforded to every 1,000 of the infant population in the rural area was 725 as against 670 in the previous year. There were 7,255 deaths from all causes, as against 8,597 the previous year. "Fever" with 1,337 deaths and respiratory diseases with 1,295 deaths being the chief causes. Infant mortality is especially low for India at Asansol, the figure for the year being 163 per 1,000 infants under one year of age as against a figure of over 200 for Bengal in general, and 330 per 1,000 for Calcutta city.

Of 5,689 persons examined 60 per cent shewed hookworm infection, the rate being highest for those working underground, 72 per cent. In municipalities only 10 per cent of regular users of latrines had hookworm infection, as against 30 per cent of irregular and non-users. Hygiene and public health lectures and similar measures were continued.

Dr Tomb's report emphasises once again that the chief problem in the mining districts is epidemic cholera. In all there were 1,200 cases with a case mortality rate of 48 per cent, and an incidence rate of 3.64 per 1,000 of the population. The history of no less than thirteen localised outbreaks is recorded, with full details of each. Contamination of water supplies, e.g., by washing infected clothing in them, is an important source of danger. April is the month of maximum incidence, but March and May are also months of heavy incidence. In every single outbreak

prompt measures were taken, and in each instance the outbreak was successfully checked. As seen in the mining area cholera is chiefly a disease of villages and municipalities, infection of the collieries being usually secondary. Many cases are due to contact, e.g., nursing of other cases. In one instance—an outbreak in Fulberia village in July with 16 cases and 8 deaths—the infection was certainly due to the importation of a carrier from Puri a cholera convalescent. The problem of whether cholera in the Asansol area is truly endemic or whether it is annually re-imported from outside endemic areas is one of great importance from an economic and public health standpoint.

The report concludes with the Bengal Mining Settlements Act of 1912 as modified up to October, 1915 with detailed statistical tables and with useful plans of a model bathing ghāt, a sanitary well parapet, and of model dhokkas and isolation huts. Dr. Tomb is to be congratulated on a year of vigorous and successful work, and a most interesting report.

THE 58TH ANNUAL REPORT OF THE DIRECTOR OF PUBLIC HEALTH, MADRAS 1921

In his annual report for 1921 Major Russell, M.S., Director of Public Health for Madras has produced a valuable and interesting document. His study of the statistics collected and sent in by the various agencies of the provinces has bare many fundamental defects in the present system of Public Health administration and points out how these can be remedied. In regard to Vital Statistics in general he says:—"The detailed statistics furnished in the statements appended to the annual reports of the Director of Public Health show extraordinary yearly variations in the birth and death rates of different districts and even of the same district. In the natural course of events such fluctuations might reasonably be expected to occur in small villages or among communities of limited numbers inhabiting portions of towns or villages. Districts and towns when considered as a whole however should not exhibit such differences because on account of the more or less evenly distributed age-groups and the similarity of local customs and habits fecundity and mortality rates will vary very little in any particular year or in any series of years except in the presence of abnormal conditions as for instance the prevalence of a widespread pandemic or epidemic disease such as occurred during the influenza pandemic in 1918. In the absence of such conditions the phenomenal variations noted in the rates cannot possibly be attributed to natural causes as local officers attempt to do unless such officers interpret slackness of duty by the registrars and irregularities in other directions as 'natural causes.' In the course of investigations conducted in a number of the towns and villages which had returned abnormally low birth and death rates it was found that numerous omissions had occurred in the registration of events. Apart from this imperfect enumeration by individual registrars another important contributing factor is the submission of incomplete returns the statistics of portions of districts and towns being shown in the return as referring to the whole of the area. The degree of error caused by such irregularity may be recognised from the fact that by its rectification the statistical rates have been enhanced in many instances as much as three to ten-fold. Even were the imperfectly enumerated events especially deaths properly posted a fair idea of the public health conditions of a locality would still be formed but many irregularities also occur in this direction omissions or inaccuracies in the posting of age and the cause of death being extremely common. Under these circumstances a large number of the Presidency returns are of little value and inferences based on them regarding the progress of public health have to be drawn with the greatest caution. The importance

of the relation of accurate vital statistics to preventive medicine may be recognised from the fact that for the inception of measures required to combat any undue sickness or mortality, it is essential that information should be available regarding the specific diseases contributing to such sickness or mortality, the communities susceptible to them and the ages at which the incidents occur, and these particulars can only be gathered from correctly maintained vital statistics. It is obvious therefore that if progress in public health matters is to be attained, local officers entrusted with the management of vital statistics must be prepared to devote every possible attention towards rectifying present defects so that at least a reasonable accuracy in the returns submitted by them may be ensured."

Discussing the birth rates submitted, he notes that Madras province had for 1921 the lowest birth rate of any province in India, viz., 27 per mille. But a detailed study of the birth rates return reveals extraordinary variations. The average real birth rate for the province was calculated to be 42.5 per mille, but not a single district returned rates anything like equal to this, the rates returned varying from 11.7 to 37.4. The causes of these phenomenal variations in the recorded birth rates have been indicated in the paragraph quoted above. There is no reason to believe that the birth rate of Southern India is so much lower than that of the other provinces in India. Compulsory registration in the districts where it has been enforced has apparently not resulted in any improvement in reliability of the figures collected.

The registration of a lower birth rate in the compulsory areas is a sequence of the indifference of the registrars both in instituting enquiries regarding the events of births and deaths, and in enforcing the penal provisions of the Act against defaulters. This is apparent from the fact that in spite of the very low birth rates registered in these places, the number of prosecutions instituted against offenders is practically nil. No law is self-enforcing, and unless those to whom its administration is entrusted enforce the same, breaches thereof will occur in ever increasing numbers."

The birth rates recorded by towns exhibit the same extraordinary wide variations, one town records a birth rate of 2.5 while another submits one of 64.3 per mille. In the case of union towns comprised of more than one revenue village, the low birth rate recorded is often due to the statistics of the main village of the union being returned for the total population of the union. The birth rate recorded by municipalities is 8.6 in excess over that of rural towns and all that this figure really represents is the care taken by municipalities registrars in comparison with those responsible for registration in rural towns. "The increase during the third quarter of the year, indicative of increased fecundity during the cold weather months, is a well-recognised phenomenon in this Presidency."

The death rates registered in the year exhibit many of the same peculiarities. The average recorded death rates for districts was 20.2 per mille, this being the lowest of any province in India. The death rates of the rural towns exhibit wide variations from 5.0 per mille to 60 per mille. Thirty-six rural towns record death rates of less than 10 per mille. As Major Russell says this might make the unwary marvel why Southern India has not long ago been boomed as a vast sanitarium. But abnormally low records of rates in this group of towns are entirely due to the incomplete statistics furnished by local officers. The rates recorded in many of the rural towns vary widely from those of 1920 which variations are not explained by any epidemic disease. Major Russell concludes that on the whole vital statistics as recorded in the majority of rural towns cannot be said to have much value and any inferences based on the available figures are apt to be very misleading. The same remark would seem to apply to the recorded death rates in municipalities.

A more detailed study of the death rates when classified according to age and sex constitution brings

antimony tartrate without effect. The only difference between the case in which there was no response to antimony tartrate over a prolonged period and the case formerly published in which there was apparent cure in three months, was that in the former case the polyp sprang from the bulbar conjunctiva and in the latter from the palpebral conjunctiva. Curiously enough in those cases in which we have observed that the polyp springs from the bulbar conjunctiva there is a small abrupt staphyloma of the sclera immediately beneath the attachment of the growth. The pathology of this is not very clear, because there is nothing of the nature of infiltration. It almost looks as if the continued drag due to the lids shifting the polyp up and down is sufficient to cause local thinning out of the sclera and subsequent bulging. This note is published in correction of my former assumption. I am now justified in making the statement that *Rhinosporidium* of the conjunctiva has in one instance withstood 2 per cent antimony tartrate drops frequently and carefully instilled for a period of fifty-five days.

Yours, etc.,
ROBERT E. WRIGHT,
Major, I M S

MADRAS,
30th January, 1923

FILARIASIS RESEARCH ENQUIRY

To the Editor of THE INDIAN MEDICAL GAZETTE
Through The Civil Surgeon, Puri,

SIR,—In connection with my papers in the *Indian Medical Gazette* on filariasis and allied subjects I wish it to be clearly understood that the investigations reported therein were not done independently by myself but that the investigation on filariasis is being done under the Government of Bihar and Orissa by Rai Bahadur Dr P N Das, FRCSE, Offg Civil Surgeon, Puri, whom I have the honour of assisting. Kindly publish this note in an early issue of your paper to remove all misconceptions about the subject.

Yours, etc.,
S K ROY,
Temp Asst Surgeon on Filariasis
Research Work, Puri

PURI,
4th February, 1923

OUR HOSPITALS AND DISPENSARIES

To the Editor of THE INDIAN MEDICAL GAZETTE

SIR,—So many Commissions have in recent years been appointed in India to make enquiries into various subjects and branches of service, that the man in the street may perhaps be permitted to ask why a mixed commission composed of official and non-official elements is not appointed to make a sifting inquiry into the internal conditions of our hospitals and dispensaries, which are now subjected to public criticism. I have been in close touch with these charitable institutions for nearly 21 years, and my impression is that they are neither efficiently managed, nor properly attended to. Practically all of them are financially embarrassed, ill-housed, ill-equipped and poorly staffed. Many of them are not really worthy of their existence. I do not think any serious attempt has ever been made to improve them, and I think public apathy and indifference is the order of the day.

I am, Sir, aware of at least one sub-divisional hospital in the district of 24 Parganas, which is capable of maintaining a whole-time lady doctor drawing an emolument of Rs 75 per mensem, but is not equipped with a sufficient stock of common medicines, common dressings, and common surgical instruments. To tell the truth, there is no one to look after the affair, and to see where money is to be properly spent, and properly saved. So this is why our institutions are not as popular as they should have been.

A commission is, therefore, urgently called for, and I hope my suggestion will appeal to you and your esteemed readers.

Yours, etc.,
SATKARI GANGULI,
Provincial Secretary,
All-India S A S Association, Bengal
3/1, KRISTO RAM BOSE STREET,
CALCUTTA,
12th January, 1923

Service Notes.

OBITUARY *

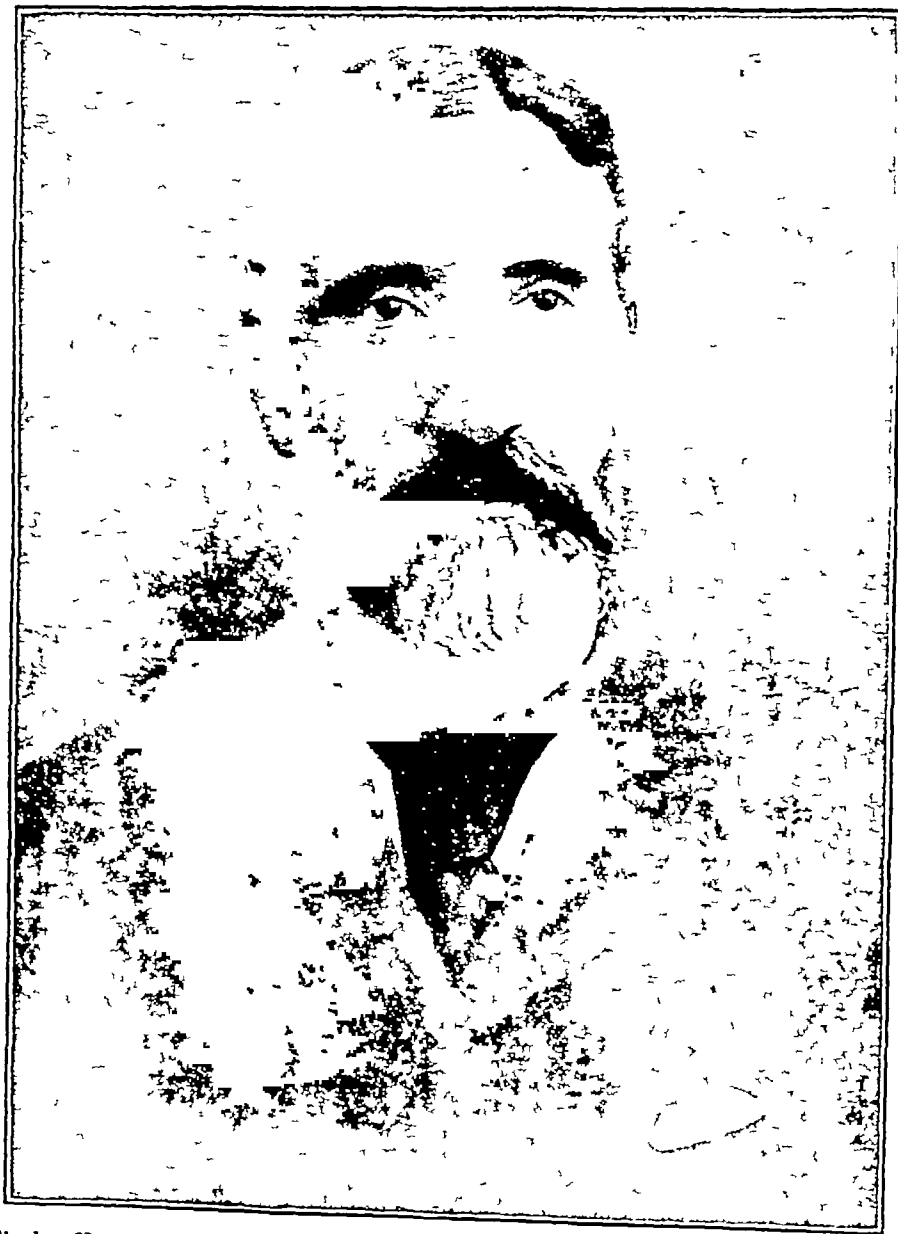
THE news of the death of Colonel Kenneth MacLeod, I M S (retired), on the 17th December 1922, at the age of 82 years will have been received in Calcutta by his many friends with much regret, as it means the breaking of another of the few remaining links with the old-time days when the Service which he so much adorned was in its pristine glory and usefulness. Kenneth MacLeod was born in North Uist in 1840, he took his M A, Edin, in 1857 and his M D, Hons, Edin, in 1861. Entering the I M S, in 1865 as the first of 70 candidates for the competitive examination, he sailed for India in the *Walmer Castle* on October 4th, 1865, landed at Calcutta on January 17th, 1866, and was posted to Jessore as Civil Assistant Surgeon. Here his suavity of manner and very great professional ability soon brought him a large practice. His attention was immediately drawn to poverty as a factor of importance in the epidemic diseases of India, and above all to cattle plague and kindred diseases of cattle as contributory factors to such poverty. In 1869 at his instance the Cattle Plague Commission was instituted and he was appointed Secretary to the Commission, and in 1871 he became Secretary to the Inspector-General of Hospitals, I M S. He was appointed Professor of Surgical Anatomy and Second Surgeon, Calcutta Medical College, in 1874. The report of the Cattle Plague Commission led to the realisation by Government of the necessity for instituting a Veterinary Department in India and Colonel MacLeod's deep interest in veterinary problems led to the inception of the Bengal Veterinary College, the foundation stone of which was laid on the 20th April, 1882, by Sir C Elliott. In connection with this College Colonel MacLeod made over the sum of Rs 2,500 to Government for the creation of a scholarship to be given to the most promising student of the College, preference being given to candidates from Jessore.

In 1879 he was appointed First Surgeon and Professor of Surgery at the Medical College, and in 1880 he founded the Calcutta Medical Society. In the same year he was served with a summons for criminal defamation by Surgeon-Major G Hall and convicted by the

*From materials kindly supplied by Sir Kailash Chandra Bose, KCIE and Dr B N Ghosh

Magistrate but the decision was rescinded by the High Court, Allahabad. As First Surgeon at the Medical College Calcutta, Colonel MacLeod soon won golden opinions, and in

of his former operations still on record at the hospital is a case of extirpation of the larynx for epithelioma, in which it is recorded that he subsequently manufactured an arti-



The late Kenneth MacLeod, M.D. (Edin.), F.R.C.S. (Eng.), LL.D. (Aberd.) Col., I.M.S. (retired),
Honorary Physician to the King

1880 he was elected an F.R.C.S., Edinburgh. In operating he was practically ambidextrous and during the absence on leave of the ophthalmic surgeon his reputation in this branch of surgery became established. Among many

ficial mechanism enabling the patient to articulate partially. He was ever a keen student not only of British and European medicine and surgery but also of Hindu and Ayurvedic medicine. He edited the *Indian Medical*

Gazette for 22 years and did much to establish the reputation of this journal

Of his many activities between 1871 and 1892, all of which centred in Calcutta, mention may be made of his interest in the Asiatic Society of Bengal, of which he was a prominent and active member of his appointment as Presidency Surgeon, which he held for six years of his valuable services as Municipal Commissioner and Health Adviser to the Corporation of Calcutta and of his efforts which led to the Medical Registration Act, Bengal

Of his many contributions to medical literature and studies in tropical medicine and surgery, his contributions to the Asiatic Society and to the *Indian Medical Gazette* on the problem of the epidemic dropsy of Bengal perhaps come first. In 1888 he described an epidemic eruptive fever simulating but apparently differing from both measles and dengue in Calcutta. His interests in his Indian co-workers is shewn by his preface to Dr Rakhal Chandra Ghose's book on *Materia Medica*. He was for many years Dean of the Faculty of Medicine and Examiner in Medicine to the University of Calcutta. In 1892 the degree of LL.D. was conferred upon him by the University of Aberdeen, and in April, 1892, having completed 27 years of service, he retired from the IMS. His retirement was made the occasion for a spontaneous demonstration in his honour by all classes of Calcutta society. Farewell parties were given by such different sections of the community as the Marwaris, the Bombay Benias, the Soortis and the Borah community. A subscription list was raised and the results distributed among the poor of Calcutta. Sir Hariram Goenka instituted a fund at the Calcutta University in commemoration of his services to that body to endow a scholarship and to award a gold medal to the student who stands first in surgery in the final M.B. examination. On the day on which he left Calcutta in the *Chusan*, a crowd of some two thousand persons was restrained with difficulty from going on board to see him off.

After his retirement Colonel MacLeod's interest in Indian medical matters by no means abated. In 1893 he was appointed a member of the Medical Board at the India Office, in 1897 he became Professor of Military Medicine, Army Medical School, Netley,—a post which he held for eight years and in 1906 he was made an Honorary Physician to the King. In 1900 his services to surgery were recognised by the degree of Honorary F.R.C.S., Eng., being conferred upon him. In 1900 he was president of the 'Tropical Diseases' section of the annual meeting of the British Medical Association at Ipswich. In 1902 he celebrated his silver wedding, his ten children being present.

Although the generation which knew Colonel MacLeod in Calcutta is now passing, many of

his students and assistants to-day look back with pleasure to the time when they were stimulated by his example and encouraged by his personal interest and helpfulness whilst the city of Calcutta owes much to his efforts in the cause of public health and to his vigorous personality

ASSOCIATION OF MEDICAL WOMEN IN INDIA

CONTRIBUTED BY MISS RUTH YOUNG, DELHI

BHIWARI HOSPITAL

A NEW hospital for women was opened at Bhiwari in the South Punjab on January 22nd.

Women's medical work in this place dates from 1891 when the hospital and out-patient department were housed in a building rented for the purpose in the city. As Bhiwari is a fairly large city (population 40,000), as well as being a trade centre for a large agricultural area, the benefit of medical relief for women was quickly felt. After eight years' work a small hospital with beds for 9 in-patients was built outside the city wall. The next addition was made in 1908 when the accommodation consisted of 24 beds and 2 cots and the medical staff included 2 doctors and one English sister. Perhaps those who planned this new enlargement of the hospital did not plan on a large enough scale, for it was not many years before this accommodation also became too cramped.

It has been a matter of a good deal of difficulty to secure the land for the new hospital and the long period of waiting on in the confined old quarters impressed upon the workers the need of allowing generous room space in the new hospital, with the happy result that the building is planned on an ample scale.

The first impression is one of space and air, and these are two of the most desirable assets of a hospital. The lay-out of the buildings divides the ground roughly into two court-yards while the main block of buildings forms an L on two sides of the inner court-yard. The other sides are formed by a wall which divides the hospital from the out-patient department and nurses' quarters, and by the house-surgeon's quarters and private wards, the two latter are however entities in themselves.

The L-shaped block consists of three main wards of ten beds each which form one limb of the L, while the other is composed of an eye ward, treatment room, maternity ward, labour room, operating theatre and sterilizing room and office.

In the wards each bed can be isolated by means of curtains supported on iron rods when so desired, either for examination or during the visit of relatives. This possibility of privacy is much appreciated by patients, and as the curtains are not drawn at ordinary times there is no impediment to the passage of air. Attached to each ward is a small ward kitchen and a separate linen closet. At either end of these wards there is a small block connected by a closed verandah with the main building, but sufficiently separate to allow of the free passage of air. This block serves as a bathing place for patients, a store for patients' clothes and a place for keeping bed pans etc. There are wide verandahs on each side of the wards.

The floors are done in Indian patent stone. On the walls five feet from the ground is a single row of white tiles below which the wall is to be painted with washable paint. Each ward has its own colour scheme in the matter of curtains, bed covers etc. so that nurses can be made responsible for the linen of any one ward.

The eye ward consisting of six beds is a special gift. The maternity ward has four beds and can be entered from the labour room which is well furnished and equipped. The operation room has a magnificent

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expanse of plate glass facing north-east, the floor is of white marble, and the equipment excellent. The private wards consist of a good sized room opening on each side into a small court, by which access is had to the hospital and to the outside world respectively. A latrine is placed in one of the small court-yards and a bathing place and cook room in the other. These private wards are highly appreciated and are a substantial source of income to the hospital.

In the outer court-yard are found kitchens, store rooms, latrines, and an isolation block of four beds. There is abundant space for future extensions.

The whole place gives the impression of very careful planning and detailed thought which is highly praiseworthy. Those who planned it knew what they wanted and acted accordingly. It is a big tribute to their sense and wisdom and the result is a hospital of which all women can be proud. The total cost will be about one lakh when the equipment is completed.

LADY HARDINGE MEDICAL COLLEGE

NEARLY every year some function has to be reported on which takes place at the Lady Hardinge College. On the 31st of January, Her Excellency Lady Reading opened the nurses' hostel which is to bear her name. This was the occasion of a representative gathering at the college. General MacWatt, the new Director-General, I.M.S., read a report to His Excellency and Lady Reading on the present state of the college and hospital. This report has two sides: one a cheerful one as it records marked progress and achievement, the other a gloomy one for the financial difficulties with which the college is faced are considerable. General MacWatt gave a very lucid account as to how these difficulties have come about, and put in a strong plea for aid from the Central Government. He pointed out that the Provincial Governments had been approached with the request for yearly maintenance grants, but that the response to this appeal had been very meagre. In the case of men's colleges, even when the buildings were due to private munificence, the administration bore the whole cost of upkeep. As the Lady Hardinge College is the only one of its kind in the whole of India it is especially incumbent on Government to support it. The Science Department has to be continued as up to now no Provincial Government has provided a college where women can study apart from men.

General MacWatt alluded to the good work done in the hospital, a record probably unique in the history of women's medical work, in that 120 beds are in use and over 100 abdominal sections were performed last year while the hospital has only been in existence for 6 years.

Lady Reading assured General MacWatt that she and His Excellency were deeply interested in the college. She commented on the successes gained by students in the recent examinations and the unique character of the institution. She then mentioned the progress of the scheme to which her name is attached especially that portion of it dealing with the Lady Reading Nursing Association.

The intention is to provide a service of Indian nurses for work among their own people, similar to the existing Minto Nursing Association.

In Delhi the head-quarters is at the Hardinge College and it is hoped later to found other centres. About five lakhs of rupees have been devoted to the endowment of this fund. Such a scheme must meet with the hearty approval of all members of the medical profession and its development will be watched with interest.

The hostel is a handsome block in keeping with the rest of the buildings. The nurses' rooms are of good size and nicely furnished while the sitting room is comfortable not to say luxurious. The sisters' quarters are also well planned for convenience and comfort.

APPOINTMENTS

MAJOR A. N. PALIT, I.M.S., is appointed Civil Surgeon of Monghyr, with effect from the 8th December 1922.

COLONEL R. HEARD, M.D., V.H.S. I.M.S., is appointed to be Inspector-General of Civil Hospitals, Punjab, with effect from the 21st November 1922, until further orders.

MAJOR W. J. POWELL, I.M.S., Superintendent, Central Jail Jubbulpore, is appointed to officiate as Inspector-General of Prisons, Central Provinces, vice Lieutenant-Colonel Bensley, on deputation, or until further orders.

TRANSFERS

THE services of Lieutenant-Colonel T. H. Gloster, I.M.S., are placed permanently at the disposal of the Government of Burma for employment as Director, Pasteur Institute, Rangoon.

THE services of Lieutenant-Colonel C. H. Bensley, I.M.S., Inspector-General of Prisons, Central Provinces, are placed at the disposal of the Government of India, Department of Education and Health, with effect from the date on which he may be relieved of his duties, for employment as Inspector-General of Civil Hospitals and Prisons Assam.

LEAVE

MAJOR M. R. C. McWatters, I.M.S., Civil Surgeon Saharanpur is granted leave on average pay for eight months followed by leave on half average pay for eight months and twenty-four days, with effect from the 15th March 1923.

IN supersession of this Department Notification No. 397 dated the 31st March 1922, Major J. F. Boyd, I.M.S., Civil Surgeon of Benares, is granted leave on average pay from the 1st January 1922 to the 19th May 1922, followed by leave on half average pay from the 20th May to the 3rd September 1922, study leave from the 4th September 1922 to the 3rd March 1923 and leave on half average pay from the 4th to the 30th March 1923.

MAJOR J. S. O'NEILL, M.C. I.M.S., Civil Surgeon, Meerut is granted leave on average pay for eight months (including four months and sixteen days corresponding to privilege leave under the old rules) followed by study leave for four months with effect from the date he avails himself of it.

IN supersession of Department Notification No. 1075(V)-391, dated the 23rd December 1921, Major (temporary Lieutenant-Colonel) H. Ross, O.B.E. M.B. F.R.C.S. I.M.S. is granted leave on average pay for four months combined with leave on half average pay for one month and twenty-nine days, in continuation of the leave sanctioned by the Government of India in Education and Health Department Notification No. 1217 dated the 30th November 1921.

LIEUTENANT-COLONEL W. S. J. SHAW, M.D., I.M.S. Superintendent, Central Mental Hospital, Yeravda is granted leave on average pay for eight months with effect from the 20th February 1923 or the subsequent date of relief.

MAJOR A. N. THOMAS, M.B. I.M.S., Personal Assistant to the Surgeon-General with the Government of Bombay, is granted, with effect from the date of relief, combined leave as follows—

Privilege leave for three months and eight days, furlough under Military Rules for one hundred and ninety-five days and study leave for nine months.

IN modification of Department Notification No. 725, dated the 22nd November 1922, Lieutenant-Colonel H. Halliday, M.B., I.M.S., Civil Surgeon, Simla (West), is granted leave on average pay for three months, with effect from the afternoon of the 18th November 1922.

NOTICES.

ANTIPHLOGISTINE

THIS well-known remedy is now available all over India. It consists of fine anhydrous and levigated argillaceous mineral, chemically pure glycerine, compounds of iodine, and minute quantities of boric and salicylic acids with oils of peppermint, gaultheria and eucalyptus and constitutes almost the ideal poultice. In dressings a quarter-of-an-inch thick and well covered by wool, antiphlogistine retains its heat for some 12 to 24 hours, whilst it is antiseptic, non-irritant and markedly hygroscopic. In addition to its well-known use as a jacket in pneumonia it is indicated in all conditions in which inflammation and congestion are present, from furunculosis to dysmenorrhœa. Amongst other conditions in which antiphlogistine is of benefit are otitis media, hæmorrhoids, gout, and such dental conditions as alveolar abscess and impacted third molar. It is put up in three sizes, 10½ ozs, 17½ ozs, and 34½ ozs only, as it is hygroscopic and a package once opened should be again most carefully sealed. For hospital use 5 lb packages are put up. Reports alike from gynæcologists, dental surgeons and general surgeons speak very highly of its value.

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MESSRS SMITH, STANISTREET have shown great enterprise in getting out this new and up-to-date catalogue. Market conditions, although still uncertain, have now settled down on a sounder basis, and this catalogue is the result. In addition to being profusely illustrated and thoroughly up-to-date, a special feature is a list on page 174 of approximate charges for repairing and re-setting surgical instruments. The catalogue is issued at Rs 5 per copy but should goods to the value of Rs 50 be ordered from the list the price is refunded, and credited in the invoice. The catalogue is well indexed and will be welcomed by all Civil Surgeons in India.

THE INTERNATIONAL CONGRESS OF OPHTHALMOLOGY

At the International Congress of Ophthalmology held in Washington in April, 1922, Mr Treacher Collins presented an invitation on behalf of all the Ophthalmological Societies of Great Britain and Ireland to hold the next Congress in London in the year 1925. The invitation was accepted on the motion of Professor Gullstrand, of Upsala, Sweden, seconded by Dr Lucien Howe of Buffalo, New York. A general committee consisting of representatives of the inviting Societies has since met and has formed an executive committee, empowered to make arrangements for the 1925 Congress. It is to be held in London during the four days, Tuesday 21st to Friday 24th July. The three official languages are to be English, French and German. The subscription for membership has been fixed at the sum of £2. Invitations will be sent to the principal Ophthalmological Societies or other representative bodies in every nation, asking them each to nominate a delegate to the Congress who will be responsible for promoting its interests in the country which he represents so as to endeavour to make it a great reunion of all those interested in Ophthalmology throughout the world.

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electrical engineering lines and, with the aid of the Research Laboratories of these Companies, the incorporation of the most recent advances in physics.

The work of Dr W D Coolidge at the laboratories in Schenectady is of world-wide renown and it is unnecessary to refer to it, except to remark that the new arrangements will enable X-ray workers more readily to participate in his inventions.

Mr C H Holbeach, previously in charge of the Coolidge Tube Department of the British Thomson-Houston Co, Ltd, is joining Messrs Watson's staff.

We may add that Coolidge Tubes will still be obtainable as usual from the regular sources of supply.

The management of Watson's will remain unchanged.

BOVRIL

SPEAKING on the problem of nutrition at the British Association Annual Meeting, held in September last, Professor E F Cathcart emphasised the high dietetic value of meat. He suggested that its nutritional importance depended not merely on the high biological value of its protein, but also on the fact that meat acted as a stimulant of cellular activity, thus supplying what is known in the American language as "pep". It is suggested that this factor explains the success of Bovril.

Notice.

SCIENTIFIC Articles and Notes of interest to the profession in India are solicited. Contributors of Original Articles will receive 25 Reprints *gratis*, if asked for at the time of submitting their manuscripts.

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Original Articles.

THE BERIBERI AND EPIDEMIC DROPSY PROBLEM

By J W D MEGAW,

LIEUT-COL, I M S

PART II

WHAT IS THE PROBABLE CAUSE OF BERIBERI ?

IN the first part of this paper it was shown that there is no criterion by which epidemic dropsy can be distinguished from beriberi, so that it is better as a provisional measure to include epidemic dropsy in the beriberi disease group. Evidence was also produced to show that the identity of avian polyneuritis and human beriberi has not been established, and therefore it is not safe to argue from animals affected with avitaminosis to human beings affected with beriberi.

Under these circumstances it is desirable to examine the beriberi problem again with a view to finding out where we stand in our knowledge of the disease.

A few examples from the recent literature on beriberi will show that we are rapidly returning to the old state of uncertainty and confusion with regard to the disease.

Jouveau Dubreuil in the *Bulletin de la Société de Pathologie Exotique* of December 1921 described a typical outbreak of beriberi among Chinese soldiers in Szechuen in the interior of China. There were no cases among the poor people of the place though they were eating the same rice as the affected people and were living on a diet which was inferior in variety and in vitamin B content to that of the victims.

All of the affected soldiers had fresh meat twice weekly and a limited supply of fresh vegetables, some of them also had a supply of beans which are specially rich in vitamin B. Their rice was incompletely decorticated in primitive country mills and part of the germ as well as part of the cortex was left on the grain. Certain barracks were affected while others escaped, and it was noticed that the affected barracks were more low lying and damper than the others and so the author suspected infection. No details are given as to the mode of storage of the rice.

Boyd in the *R A M C Journal* recently described an outbreak on a troopship on a voyage of a month's duration from Karachi to Marseilles. There were 37 cases, the food was good, but there was overcrowding. There was no evidence of vitamin deficiency, food

intoxication and infection proved to be the most likely possible factors.

In the editorial of the *Journal of the American Medical Association* for November 4th, 1922, an outbreak at Porto Rico is discussed. The conclusion arrived at is that the "beriberi syndrome plus chronic proteid starvation was responsible, whilst infection was ruled out." In the same editorial it is stated that Musgrave and Crowell "abandon the intoxicant or bacteriological origin and show no great enthusiasm for vitamin dietary in the treatment of the disease."

The *Bulletin of Tropical Diseases* gives a valuable condensed summary of recent papers on beriberi, and in the number for December 1922 there are several abstracts of papers of considerable importance.

Barbe reports 251 cases with 7 deaths, his conclusion is that the disease is an ascending neuritis due to intoxication derived from food and comparable to ergotism.

Mauriac had 21 cases in Senegalese troops in France with one death, he found no evidence of food deficiency.

Widdoghe saw localised and periodic outbreaks in Lukuga especially in the rainy season, there was a high mortality (27 per cent), the diet was the same, whether the disease was present or not, he believes in carriers of infection as he found little evidence of spread of infection among the patients in the hospital.

Holst in Norwegian ship cases found no evidence of infection and noted that some cases were cured by fresh vegetables, but not all.

Leporini writing of cases in Bengasi of the "epidemic dropsy" type believes in a specific infection.

DaMello found no evidence of alimentary infection.

Vedder combats the view which has been expressed by others of the importance of carbohydrate excess and holds that the vitamin content only is of importance.

In other recent articles the following views are expressed.

Taguchi in human experiments referred to in Part I of this paper produced symptoms in five men fed on polished rice, numbness of the hands appeared within four days, and he had some success in treating with rice bran extract, but concludes that the symptoms were not absolutely identical with beriberi as there was a slowing of the pulse and a fall of temperature.

Hofmeister believes in a toxin.

Lebrede believes in two causes the one he calls "predisposing," this is alimentary and causes the chronic type, the other is "toxic" causing the acute and sub-acute forms. He isolated a spore bearing organism which produced a toxic substance in the starchy part of the rice. The spores resist heat at 100°C for

20 minutes and the toxin is very virulent when injected intraperitoneally it has a special action on the nerves

Sicard and others in cases in Marseilles found that there was no spread of infection. There were congestion and hæmorrhage of the stomach and intestines, there was nerve degeneration but no interstitial neuritis. McCarrison finds evidence from animal experiments that there are three factors—avitaminosis, ill-balanced diet, and infection. He believes that excess of starch plus avitaminosis causes disordered endocrine function and thus disturbed carbohydrate metabolism and muscular atrophy. The œdema is due to excessive adrenalin output.

Sprawson in Mesopotamia met with a form which showed some of the features of the epidemic dropsy type, the knee jerks being present in 27, increased in 18, and lost in 17. He was of opinion that some of the cases were true avitaminosis, while others were due to alimentary infection, and the rest to a combination of avitaminosis and some depressing cause. He prefers to use the term the "beriberi syndrome" believing that there is not a definite disease but a combination of two factors in varying degree.

Wilcox holds that the cases in Mesopotamia were due to deficiency in vitamin B.

Bassett Smith in a recent review in the *Tropical Diseases Bulletin* states that it is certain that the disease is due to a deficiency of vitamin B, though the purely negative deficiency view is probably not enough to account for the disease.

Honda finds the post mortem changes to be those resulting from a toxin.

My colleague Acton has formed the opinion that rice is infected with a spore-forming anaërobe which, under certain conditions of temperature and humidity, multiplies and produces a poisonous amine. This has not yet been satisfactorily isolated and more work remains to be done on the subject. He agrees with me that conditions of storage of the rice are of great importance.

These opinions recently expressed by workers of various nationalities are enough to show that there is no happy unanimity regarding the cause of beriberi and that such old-fashioned views as lack of nutritious qualities of the food, intestinal infection and even food intoxication are being expressed.

It is, in fact, quite clear that we are rapidly returning to the state of doubt which existed before Braddon wrote his remarkable book in 1910 and converted the medical profession to the rice intoxication view. This view had a short sway as it was replaced by the vitamin B deficiency view which was very ably stated by Vedder in his book in 1913. There is at present no unanimity as to the cause of the disease

nor even as to whether beriberi is a clinical entity at all.

A brief examination of some of the views of the causation of beriberi will first be made.

Only a few of the most important of the views which have been stated are mentioned.

(i) Beriberi includes a group of diseases each of which has a specific cause (Dürck, Luce and Nocht).

(ii) Beriberi is a specific disease, caused (a) by a toxin* produced by a germ outside the body and inhaled or absorbed by the skin (Manson),

(b) by a food poison developed in rice (Vorderman, Braddon, etc.),

(c) by a bacterial infection (Pekelharing, Hamilton Wright),

(d) by fungi growing on mouldy rice (Hose).

(iii) Beriberi is due to deficiency of the diet in

(a) Fat

(b) Proteins (Takaki)

(c) Organic phosphorus (Schaumann)

(d) Vitamin B (Fraser and Stanton, etc.)

Dürck's view that the disease is a group rather than a single entity will commend itself to many, but so far it has not been possible to draw a dividing line between the varieties of beriberi and it is likely that we shall not clearly understand the variations in the manifestations of the disease until we have discovered the cause or causes. It is quite certain that any factor which lowers the nutrition of the body will predispose to beriberi and will also aggravate its symptoms, but if the disease is one it is likely that there is one essential cause, and it is to the discovery of this that efforts should be directed. Manson's view has been tacitly ignored for some years, but any suggestion which came from the great master of deduction cannot be treated with contempt. His view was that the disease was produced by (a) a toxin, (b) the product of a germ, (c) operating in some culture medium, (d) outside the body, (e) this toxin enters the body neither by food nor by water and so he concluded that (f) it must enter by the skin or by inhalation. His deductions (a) to (d) fit in with all the known peculiarities of the disease and have not been disproved, but it appears that he was misinformed as to the possibility of the toxin entering the body with food. He based his argument against food intoxication on Travers' experience in Pudoh jail. In this case two groups of prisoners in different jails were eating the same food, one of these groups suffered from beriberi, the other escaped. Braddon has shown that there are

* The term toxin is probably used by Manson in a general sense rather than in the limited bacteriological sense.

two fallacies in connection with the previously accepted interpretation of this experience (1) In the affected jail only long term prisoners were kept so that there was time for them to develop the disease, while in the other jail there were short term prisoners who had not time to develop it (2) The rice was not necessarily the same, it was obtained from the same contractor who received it from several merchants, these collected it in bags from various sources in the country, so that it by no means follows that the rice was really the same For these reasons we cannot accept Manson's conclusion that a poison entering with the food can be excluded, but all his deductions should not be flung aside merely because one of them which was based on incomplete information turns out to be unjustified

The view of infection of the body by bacteria conveyed from case to case has been widely held in connection with epidemic dropsy in Bengal it has also been maintained by many writers on beriberi

The tendency of the disease to appear suddenly in a community or family and the absence of any other satisfactory explanation of certain outbreaks are points which suggest the presence of infection The case for infection is often assumed to be proved because the disease sometimes occurs in one place, whereas people living in another place escape in spite of the fact that they are eating "the same rice" This term "the same rice" is used in a very loose way, it usually means rice of the same kind, changes which may take place during storage being entirely ignored None of us would buy a motor tyre merely on the strength of its name, we should object to take one that had been stored in a hot place, exposed to strong light for a year or two, so there is no reason why we should be contented with a description of a sample of rice which does not take into account possible changes due to age and conditions of storage

The evidence of a case to case infection usually breaks down completely when all the conditions are closely investigated but an alimentary infection caused by infected rice is not so readily excluded by the known epidemiological facts From a practical point of view this view is not on the same footing as that of a case to case infection The control of the disease will be essentially the same whether we are dealing with a poison ready made in the rice or one that develops in the alimentary canals of persons who eat infected rice In both cases methods of preparation and storage will be of prime importance

Some of the facts which are against the existence of a specific infection conveyed from man to man are —

(1) No microbe has been shown to be uniformly associated with the presence of the

disease (2) All attempts to infect animals by inoculation with materials from persons suffering from the disease have failed, so have feeding experiments, only one human experiment has been carried out, so far as is known to me, that was the one in which the blood serum of a patient in the early stages of an attack of epidemic dropsy was injected into myself This, as was expected, gave entirely negative results (3) Persons who suffer from the disease at once respond to a change of diet unless the disease has reached a very advanced stage, whereas an infection would be expected to run its course (4) Persons brought into intimate contact with patients have not been shown to be more likely to contract the disease than others living on the same diet (5) There is no immunity resulting from an attack but rather the reverse (6) No reaction of immunity has been demonstrated (7) The strongest point of all is that the management of outbreaks on the assumption of their being due to infection has always failed, so that for practical purposes infection may be ruled out In the very rare cases in which infection appears to be the most likely explanation, there are always other possibilities and it is reasonable to argue that if infection can be excluded in the vast majority of cases it should not be accepted as an explanation in the very exceptional cases, unless there is positive evidence of its existence

Deficiency in fats, proteins and organic phosphorus is likely to predispose to and aggravate the disease, such deficiency is entirely insufficient as an explanation of the cause of the disease

THE VITAMIN B DEFICIENCY VIEW

This view is no longer so uniformly accepted as a complete explanation of beriberi as it was a few years ago, but it still holds the field as the orthodox explanation of the disease, and it must be considered seriously

As Vedder in his very able book has stated the case for deficiency of Vitamin B we may begin by examining the more important points which he makes in its favour It is only necessary to deal with those points which are not equally in favour of the intoxication view It is a waste of time to examine in detail the evidence which most of the writers place before us regarding diet Hardly ever do we find information which will enable us to form a reliable opinion, each observer lays stress on the points which appear to him to be important but he nearly always ignores other points which may be of first-rate importance

The bulk of the evidence implicates polished rice, and it is now agreed by everybody that polished rice forms a large part of the diet of most of the people who suffer from beriberi The crucial difference between the views of

Vedder and Braddon is that Vedder believes that the *addition* of Vitamin B to a diet which causes beriberi is enough to put a stop to the disease, whereas Braddon holds that under certain conditions the polished rice becomes toxic so that the mere addition of any other substance will not prevent the disease. It is therefore necessary to examine the evidence which bears on this point.

One of the most crucial experiments on the subject of rice *versus* infection was that conducted by Fletcher in the Kuala Lumpur Asylum in 1909. The asylum had for years been a hot bed of beriberi, and Fletcher, who was originally an opponent of the polished rice theory and an advocate of the infection view, kept half of the inmates on a diet containing polished rice in addition to other articles, while the other half were fed on cured rice instead of polished rice. No fresh cases of beriberi occurred among the eaters of cured rice while eaters of polished rice suffered heavily from beriberi. Repeated control experiments of this kind had the same result, and the final test was to transfer all the inmates who were on cured rice to the quarters hitherto occupied by those who had been fed on uncured rice and *vice versa*. The result was the same, it was always among the persons who ate uncured rice that the disease occurred, in spite of the fact that the uncured rice was of the best quality.

This experiment like many others of a similar kind is evidence that polished rice was responsible for the disease, but there is no clear evidence of deficiency of Vitamin B in the diet as all the inmates had fresh meat to the extent of 16 oz weekly, fresh fish 11 oz weekly, vegetables 8 oz daily, and coconut oil $\frac{2}{3}$ of an ounce daily. The water was the same in both.

A strong point is made by Vedder of the experiments of Hulsoff Pol who abolished beriberi in an asylum by substituting 150 grams of a bean (*katjang idjo*) for one of the rice meals. Vedder states that this result will convince any one that the disease can be prevented by the addition of *katjang idjo* to the diet. It is surely not hypercritical to suggest that there was not merely an *addition* to the diet, there was *substitution* of a highly nutritious article for part of the customary rice and therefore the dose of any poison contained in the rice would be cut down to a corresponding degree, while at the same time the available proteins of the diet would be considerably increased with the result that the resisting powers of the inmates against the hypothetical poison would be raised. Vedder records another interesting experiment in which Hulsoff Pol gave 150 grams of the bean daily to 31 patients who had suffered for a long time from beriberi, they lost their dropsy but still suffered from paralysis.

A reasonable interpretation of this result would be that with the substitution of the bean for part of the rice the dose of the poison was cut down, the patients' nutrition was improved, and so the disease became less severe. Vedder's interpretation is that the *addition* of the bean was the essential factor, however. A few cases are reported by Vedder in which the administration of an extract of the bean caused considerable improvement in the oedema of beriberi patients, but as yet the evidence regarding this is scanty.

Vedder in attacking the "spoiled rice" view says that in many cases the rice appeared to be of excellent quality, also that the alleged toxin *cannot* be extracted from the suspected grains. If he had said that the alleged toxins *had not hitherto* been extracted he would have been on safer ground, it still remains to be seen whether it cannot be extracted, and as for the rice being of apparently good quality, the subtle poison which has been hypothecated does not necessarily produce any obvious physical changes in the rice. Vedder also attacks Braddon's view that the undermilled rice owes its immunity to the outer layer which protects it against the hypothetical germ and states that there is no reason why the germ should not attack the parts of the grain which have lost the protecting coat. He must however concede that the incomplete protective layer is likely to give partial protection to the grain and therefore the undermilled rice would be likely to have less toxin than overmilled rice. In the case of a poison such as may be at work in the causation of beriberi, the dose is of great importance just as it is in the causation of alcoholic neuritis. If the dose is considerably diminished and the diet at the same time becomes more nutritious the result may be the disappearance of the disease.

In the epidemic dropsy type of the disease country parboiled rice has often been the kind in use so that the outer protective coat of the rice does not give complete protection against the disease. Vedder's objection is therefore met in the case of this form of the disease. Vedder states that "The evidence is clear that beriberi is not acquired NO MATTER IF CONSIDERABLE STALE WHITE RICE IS EATEN provided that a sufficient quantity of other proper food is eaten." With reference to this point my own experience as well as that of many others who have studied the epidemic dropsy form of the disease in India is at variance with that of Vedder. In the cases seen by me at the Calcutta General Hospital in 1909, all the patients ate rice as one constituent of a varied European diet, some of them ate rice with one meal only out of three and then as part of the meal. My Allahabad cases, referred to in Part I of this paper, were members of a family whose "other

proper food" was in considerable quantity, yet they suffered severely

Vedder regards epidemic dropsy as a deficiency disease closely related to beriberi, the deficiency being in a diet whose staples are decorticated rice and dal

Vedder assumes that the hypothetical rice poison ought to be produced in every specimen of white rice which is kept under certain conditions of storage he does not allow for the possibility of the rice being accidentally infected with a specific germ, the presence of which is essential to the formation of the poison

In one very striking case in my Allahabad series the patient was an exceptionally well nourished gentleman who began to show symptoms of the disease within about a week of his entering the affected family from a distant place. In his case vitamin deficiency was extremely unlikely. If such a case stood alone it might be explained away, but it is only one example of many similar cases in which the disease is quite impossible of explanation on the vitamin deficiency view

The well-known experiments of Strong and Crowell on nineteen condemned prisoners in the Bilibid prison are the most satisfactory controlled experiments on the production of beriberi in human beings by feeding them on polished rice, and for this reason, with the help of my assistant Dr Bhattacharji, I have prepared a table which shows clearly some of the outstanding features of the experiments

The diets actually consumed by the prisoners during the first ten weeks of the experiment are dealt with in the analysis, in the later stages of the experiment the prisoners became capricious in their diet. It will be agreed that the first ten weeks were the most important part of the experiment as far as diet was concerned, especially as all the symptoms which are described developed within that time

The following points may be noted (I) The available protein value of the diets was low (II) All the prisoners lost weight to a considerable extent (III) There was no uniformity in the occurrence of the symptoms shown by the prisoners, some of the prisoners who were fed on extract of rice polishings developed symptoms, and so did some of the prisoners fed on red rice, while some of the prisoners who were fed on polished rice deficient in vitamin B escaped (IV) The diets appear to be by no means devoid of vitamin B, such articles as onions and bananas may contain it in considerable quantities though certain authorities regard them as being almost devoid of the vitamin (V) The symptoms are somewhat puzzling and suggest a combination of the features of beriberi and lowered vitality due to deficiency in available proteins (VI) Though the brand of rice

TABLE IV
Analysis of Records of Strong and Crowell—Bilibid Prison Experiments The diet figures show the average daily diets during the first ten weeks of the experiment
A — Prisoners who were regarded as showing Beriberi symptoms

Group	Number	White rice in grms	Red rice in grms	Extract of rice polishings	Onions in grms	*Other articles in grms	Proportion of this group showing symp toms	Average weight in lbs	Average loss of weight in lbs	Protein value of diet	Average Carbo hydrate value of diet	Average Calo ries	Number with lost jerks knee	Number with edema.	Number with tender calves	Number with increase in cardiac area.	Blood pressure	Pulse rate in beats a minute
I	2	362	0	+	51	177	4	120	13.5	31.3	351	1786	0	1	2	+	Fall in $\frac{1}{2}$ Slight rise in $\frac{1}{2}$	—
II	4	406	0	0	33	173	$\frac{3}{4}$	118	9	33.5	383	1949	4	4	0	+	Fall in $\frac{1}{2}$ Unchanged in $\frac{1}{2}$	—
III	2	0	418	0	44	182	$\frac{3}{4}$	123	10	45.6	392	1,970	0	0	0	+	Fall in $\frac{1}{2}$ Unchanged in $\frac{1}{2}$	—
IV	6	384	0	0	43	197	$\frac{1}{2}$	124	7	34.0	384	1820	4	4	1	+	Fall in $\frac{1}{2}$ Unchanged in $\frac{1}{2}$	—
B — Prisoners who were regarded as free from Beriberi																		
I	4	366	0	+	60	190	+	127	6	32.95	358	1,800	1 (from outset)	0	0	+	Fall in $\frac{1}{2}$	—
II	2	410	0	0	38	176	$\frac{1}{2}$	129	10	34.72	390	2,060	1 (from outset)	1	2	+	Fall in $\frac{1}{2}$	—
III	4	0	427	0	47	184	$\frac{1}{2}$	123	8	47.3	400	2,150	0	0	0	+	Fall in $\frac{1}{2}$	—
IV	5	361	0	0	48	192	+	111	7	32.45	380	2,026	0	2	0	+	Fall in $\frac{1}{2}$ Unchanged in $\frac{1}{2}$	—

* Approximate daily average Bananas 80 grms. Bacon 30 grms Bread 50 grms Lard 8 grms, Sugar 12 grms Total 180 grms
There was a fall in the pulse rate of more than 10 beats a minute in two cases of this group
† Proportion free from symptoms

employed is stated there is no mention of its age nor of the conditions of storage, and when we consider that some people assert that beriberi has never been caused in persons whose rice is perfectly fresh, it is essential that this point should be taken into account

Vedder explains the occurrence of definite symptoms among the prisoners who were given extract of rice polishings as being due to the use of an insufficient amount of alcohol in the preparation of the extract, and he thinks that the partial failure of the red rice to prevent symptoms was due to the rice not having been sufficiently undermilled

It can hardly be claimed that the Bilibid experiments demonstrate the truth of the vitamin deficiency view. If it were possible to frame a diet which is satisfactory in all other respects but is deficient in vitamin B only, the result of an experiment with it would be very interesting, but such a diet is exceedingly hard to devise and it is impossible to point to any set of human experiments in which symptoms suggestive of beriberi have occurred in persons whose diet has been deficient in vitamin B alone and not also in other constituents

Probably the strongest evidence in favour of the vitamin B deficiency view is that given by Vedder in his account of infantile beriberi. This disease appears to be the same as the beriberi of adults, the symptoms are essentially similar and the post mortem changes include considerable hypertrophy of the heart. Vedder states that the administration of extract of rice polishings causes prompt diuresis and rapid improvement even if the child continues to feed at the mother's breast

This point is very strongly in favour of the causation of the disease by a vitamin deficiency, but it must be noted that many of the Philippino physicians support the intoxication view of the disease and advocate removal of the child from the mother's breast at once. Musgrave and Crowell are reported as stating that nowadays they have "no pronounced enthusiasm for the dietary treatment management of beriberi as dictated by a modern study of vitamins" and as asserting that "a glass of milk is a better tonic for the patient than all the drugs of the pharmacopœia." With these views I am in hearty agreement as it has for years been an article of faith with me that to cut off the rice supply and to give a diet rich in fresh animal proteins such as are contained in milk, eggs, etc., is the best way to deal with beriberi

It may also be noted that if infantile beriberi is a deficiency disease it is remarkable that the cardiac condition should be so different from that of animals suffering from avitaminosis

Beyond making these remarks I do not propose to discuss the question of infantile beriberi as I have no personal experience of the disease

Vitamin B is far from being a definite substance and it has already been shown there is a great difference of opinion as to the amount of vitamin B which is contained in such important articles of diet as fresh milk and fresh vegetables. If we were to assume the lowest estimate of vitamin B in the various food stuffs, we could condemn the diet of a large proportion of the people of the world as being deficient, but we know from experience that beriberi is not of frequent occurrence among many communities whose diets are capable of severe criticism in this respect, we also know that the disease does occur among people whose diets cannot reasonably be found fault with in respect of the vitamin content

It is in connection with the epidemic form of beriberi with which I am best acquainted that the vitamin deficiency view breaks down most completely. There is no evidence that there is any association between the amount of vitamin B contained in the diets of the affected persons and the occurrence of the disease, and, on the other hand, there are many cases in which the disease had so short an incubation period that vitamin deficiency could not have played any important part in causing the disease. Taking all the evidence which has been brought forward I feel justified in saying that if all the cases which are usually grouped under the label of beriberi are examples of one and the same disease, then that disease is not caused by vitamin deficiency

It is of course possible that there may be more than one disease and hence there may be more than one essential cause. One of these causes may be vitamin deficiency. It is also possible and even probable that vitamin deficiency plays an important part in most outbreaks of beriberi even though it may not be the essential cause. Vitamin B deficiency will certainly lower the resistance of the body to the action of poisons or other causative agencies. For these reasons it would not be safe to exclude vitamin deficiency from consideration though there are good grounds for the suggestion that the deficiency view has occupied far too important a place in the beriberi picture

The view that epidemic dropsy is due to poisoning by adulterated mustard oil has been widely held in Calcutta. The subject has been fully dealt with by Colonel Greig, but to my mind the most unanswerable objection to the view is that outbreaks of a similar form of disease in other parts of the world occur among people who do not employ mustard oil or any of the suspected adulterants of that oil in their diet

THE RICE INTOXICATION VIEW

Most of the evidence which has been brought forward in favour of the diet deficiency views is equally in favour of the rice intoxication view. Some of the difficulties in connection with the acceptance of this view have already been dealt with. Most of Manson's deductions, which were based on his own observation of the behaviour of the disease, are in support of this view, and Braddon's forceful arguments founded on a great mass of facts have not been refuted. All who are interested in beriberi should read Braddon's book as well as Vedder's, and they should remember that Vedder has had the last word in the argument. Among the arguments in favour of rice intoxication are:

(i) The symptoms of beriberi, especially of the epidemic dropsy form and the acute fulminating form, are much more suggestive of an intoxication than of the deficiency disease which is produced experimentally in animals.

The signs of gastro-intestinal irritation followed by neuritis and cardiac involvement, the excitation of the heart, the tendency to sudden heart failure, the frequent occurrence of cardiac dilatation and respiratory embarrassment and the hypertrophy of the heart which is nearly always a pronounced feature of autopsies on those who have died of the disease are much more suggestive of an intoxication than of a deprivation.

The general resemblance to the symptoms caused by alcohol and arsenic are points in favour of an intoxication, while ergot poisoning furnishes an even more striking parallel, as in that disease there is the formation of a poison in a grain by the action of a fungus, there is often gastro-intestinal irritation followed by neuritis and by vasomotor disturbance of a form somewhat analogous to that seen in beriberi.

(ii) The seasonal prevalence of the disease and its association with the use of old rice, also its uniform disappearance with the taking into use of fresh new rice suggest that the disease is due to changes which have taken place in the rice during storage. In an enquiry by Dr Banerji into the Howrah outbreak of 1918-19 he found that all the victims were using rice of at least a year's storage in every case.

Braddon has made a categorical statement that beriberi never appears among the eaters of new rice. This is dismissed by Vedder with the remark that he "believes the statement to be an error" and that "it is a negative statement which Braddon cannot prove." So far as my experience goes in connection with epidemic dropsy Braddon's remarkable claim appears to be justified. The disease has never been shown to occur among villagers who are living on the rice which they have prepared in small quantities in their usual manner. When it is remembered that many millions

of people in Bengal adopt this method of preparing rice it ought to be very easy to find cases of beriberi among the users of fresh rice if such cases did exist.

In my note on cases of the "epidemic dropsy" type of beriberi at the Presidency General Hospital, Calcutta, in the *Indian Medical Gazette* for April 1910, reasons were given for considering the disease to be due to a fungus or other allied vegetable parasite which developed on the rice during the period of storage, and it was thought likely that the rice storehouses had become infected with the hypothetical organism.

Special comment was made on the freedom of the prisoners in the Calcutta Presidency Jail, and it was thought that their immunity was due to the care which was taken in storing their rice supply. A little powdered lime was mixed with the rice and opportunities were taken of drying the rice in the sun during the rainy season. I suggested that the methods of preparing and storing rice which had proved to be successful in preventing the disease in the past should be put into effect without waiting for the results of the investigations which were being carried out, and though my views on the causation, treatment and prevention of the disease were based on a very limited experience they appear to be worth considering even at the present time.

(iii) The sudden and mysterious appearance of the disease among families and communities whose diet shows no obvious change is a remarkable feature of beriberi, especially of the epidemic dropsy form of the disease, which calls for explanation, the food intoxication hypothesis fits in with this observed fact much better than the vitamin deficiency hypothesis. The capriciousness of beriberi does not appear to have received as much consideration as it ought to have done. There must be some reason for the great variations in the prevalence of the disease in institutions and communities whose diet remains apparently the same year after year. The infection theory has naturally been regarded as the explanation of this capriciousness, but in every case in which a crucial test has been applied, the theory of infection has broken down.

If it were merely a question of the composition of the diet, the disease ought to appear with some degree of uniformity among the eaters of a particular brand of rice, but the evidence goes to show that it is confined to those who eat rice which has been stored for a considerable time, and in Bengal even par-boiled rice is capable of causing the disease.

Greig in his very able report on epidemic dropsy in Calcutta noted that the disease occurred at times when the price of rice was high, and he thought that this association was due to the diet of the middle class people becoming especially one-sided at such times.

Actual evidence of a pronounced change in the dietary was not brought forward and it appears to me that another factor which must be taken into account is that at times when high prices prevail the rice dealers are likely to hoard their supplies in the hope of getting still higher prices so that the rice would be stored for longer periods than usual, and for this reason poisons would be more likely to develop in the rice. This view is also held by Acton who has studied this aspect of the question and obviously the question of storage is one which must be considered seriously.

(iv) The frequent appearance of the disease among people whose diet is obviously richer in nutritive properties and in vitamin B than the diets of the people around them who remain free from symptoms is a notable feature of epidemic dropsy. The most natural assumption is that in some way their food has become toxic. In favour of this view is the fact that the disease is always arrested when the rice supply is changed to new rice even if no other change has been made in the diet. It may of course be argued that some essential accessory food factor has disappeared from the rice during storage, and though this explanation is not in keeping with the other observed facts its acceptance would lead to the same method of handling the disease as if a poison were in question, so that the point is of more theoretical than practical importance.

The facts observed by myself in connection with the epidemic dropsy form of the disease suggest that the hypothetical poison is not always developed in stored rice even when conditions of heat and moisture are present, and therefore it is likely that the poison results from some accidental infection of the rice by a microbe. The argument that no obvious change has been detected in the rice in many of the cases is by no means insuperable when we consider the example of botulism and other forms of food poisoning in which powerful poisons may develop in foodstuffs without any obvious change in the appearance or taste of the food, and also the example of arsenic poisoning by beer which appears to be perfectly good.

If a poison will explain the observed features of the disease better than any existing hypothesis we need not reject the view merely because the poison has not been isolated and identified, the poison may be of a subtle nature and difficult to detect.

(v) The repeated appearance of the disease on certain ships like the *S S Investigator* of the Indian Marine, and the frequent reappearance of the disease in certain houses can best be explained on the hypothesis that the store-rooms have become infected with a certain germ which attacks successive sam-

ples of rice. The conditions of temperature and moisture and the mechanical condition of the rice must of course be favourable to the growth of the germ.

(vi) The fact that the disease is usually severe in proportion to the amount of the incriminated rice which has been consumed has been noted by Braddon and other observers besides myself. This relationship has been observed in cases in which the other articles of diet contain ample nutritive principles as well as vitamins.

(vii) The shortness of the incubation period in well authenticated cases is a strong point in favour of a poison.

(viii) The occurrence of infantile beriberi in puppies and in the children of beriberi patients which have been suckled by women suffering from the disease appears to be more suggestive of an intoxication through the milk than of a deficiency disease, especially as the cardiac hypertrophy and other symptoms are in keeping with the beriberi of adults rather than with experimental avitaminosis in animals.

(ix) The frequent occurrence of the epidemic dropsy form of the disease in persons who eat parboiled country rice is a significant point. This rice is supposed to contain the necessary anti-neuritic vitamin and hence those who eat it ought to remain free from the disease, especially if they also eat a liberal supply of fresh vegetables, meat, milk and dal or other leguminous seeds rich in vitamin B.

A poison produced in parboiled rice may be different in some respects from one produced in polished rice.

If we admit the possibility of variations in the nature of the poison depending on the composition and mechanical condition of the rice, the great variations in the symptoms of beriberi become easy of explanation. It is also possible that more than one infective agent may occur, though on the whole the remarkable constancy of the cardio-vascular symptoms would appear to indicate a close relationship between the poisons which are responsible for the disease.

(x) A point of great interest and possibly of crucial importance with regard to epidemic dropsy is the relative freedom from the disease which Calcutta has enjoyed in recent years. In my enquiries into the conditions of manufacture and storage of rice in Calcutta I found that within the past few years numerous rice mills have sprung up in the immediate vicinity of Calcutta. In these the rice is prepared by parboiling, and as the prepared grain is being turned out in a steady stream to the dealers, the rice from these mills which is eaten in Calcutta is seldom stored in the prepared condition for more than a few months before it is sold to the consumer. Rice stored

in the form of paddy is much less likely to undergo deterioration or changes due to micro-organisms than rice which is stored in the prepared condition. It is an interesting fact that in the autumn of 1918 there was a serious outbreak of epidemic dropsy in Howrah which is separated from Calcutta by the river Hooghly. This outbreak affected those persons who are in the habit of eating old country rice, much of which is imported by river from the districts in the interior of Bengal. While this outbreak was widespread in Howrah it was very slight in Calcutta and it seems possible that the relative immunity of Calcutta may be due to the fact that a steadily increasing part of the Calcutta rice supply comes from the recently established rice mills. On my suggestion enquiries are being made into this point by Dr. Banerjee and Dr. Bhattacharya at the present time, so that it is premature to do more than merely to suggest that *prima facie* evidence exists that a very serious outbreak may have been prevented in Calcutta by the introduction of the present method of dealing with rice supply of the city.

It will be exceedingly satisfactory if this recent industrial development should be found to protect Calcutta from recurrences of the dreadful visitation which is so well remembered by those who experienced it in 1909, this much can be said with confidence that the newer methods of dealing with the rice supply of Calcutta constitute an approach to the old manner of treating rice which has been followed with safety by the country folk of Bengal for many generations.

(a) An objection to the rice intoxication view is that beriberi, including epidemic dropsy, has occurred among persons who do not appear to have included rice in their diet.

These cases are so exceptional that it is necessary to examine them carefully. One possible explanation is that rice may have been used as an adulterant of wheat flour or other articles of diet.

This is known to take place when unscrupulous dealers see their way to making an extra profit owing to the relative cheapness of rice. Another possible explanation is that under exceptional circumstances the poison may be formed in other grains besides rice.

ALIMENTARY CANAL INTOXICATION VIEW

One view which cannot be ignored is that a spore-bearing organism which is found in rice may produce a poison in the alimentary canal under certain conditions. It is known that spores found in rice are capable of surviving after boiling for twenty minutes, so that there is nothing impossible in the suggestion that rice may remain infected even after cooking.

The facts observed in connection with beriberi would suggest that if bacteria produce a

poison in the body they would exist as saprophytes rather than as parasites in the alimentary canal and a continued supply of microbes must be taken in with the food if the manufacture of the poison is to continue.

It does not seem likely that spores taken into the intestine with the rice could multiply so rapidly as to produce poisons in the upper alimentary tract, and the changes found in the body after death suggest that the poison causes irritation of the stomach and upper intestine rather than of the lower gut. The very short incubation period in some cases of epidemic dropsy is also against this view, and on the whole it is much easier to believe that any poison produced by microbic action on rice would be formed during the prolonged period of storage of the rice rather than during the short time that it takes to pass through the alimentary canal.

The view is, however, worth more serious consideration than it has hitherto received, but as there is no evidence that rice which has been prepared and stored in a proper manner is capable of causing beriberi the question of the formation of a hypothetical poison before or after the rice enters the body is not of supreme importance from the point of view of prevention and treatment of the disease.

Although on the whole my view of the probable cause of the disease is essentially the same as that of Braddon, there are some points in which I do not agree with him.

(a) Braddon regards ship beriberi and epidemic dropsy as different diseases from beriberi. He appears to have been influenced chiefly by the arguments which were brought forward against intoxication as the cause of these diseases. He was inclined to define beriberi as a disease caused by rice intoxication and so he excluded all diseases which appeared to be due to other causes. The advocates of the vitamin deficiency view will also be compelled to exclude all outbreaks in which there is evidence that there is a sufficient supply of vitamin B in the diet.

(b) Braddon does not think it possible for the disease to occur among eaters of parboiled rice, while I believe that some forms of the disease are not uncommon among eaters of parboiled rice, which has been stored for long periods.

(c) Braddon as a corollary to his views asserts that the disease can be abolished by the use of cured rice, while I consider that the storage of rice of all kinds must be attended to.

Within the limits of a paper of this kind it is not possible to deal in detail with the very voluminous literature of beriberi and only the points of outstanding importance have been briefly touched on.

It must be clearly understood that while the rice intoxication view appears to me to

explain the facts which are known in connection with the beriberi disease group there is no desire to ignore the anti-neuritic accessory food factor. The importance of this as well as of the other accessory food factors is well established, and it is quite possible that deficiency in vitamin B may play a part in the causation of beriberi similar to that played by malnutrition in dysentery. It is only with those who insist on vitamin B as the only factor of importance that my quarrel lies, I hold that to insist on vitamin B as the one essential factor in causing beriberi is a dangerous attitude. I think that further research into the cause of beriberi is still essential, and that rice intoxication must still be seriously considered as a possible, and even as a highly probable, factor.

We do not yet know what beriberi is, but we know a great deal about the conditions under which it occurs, if we act on that knowledge and refuse to commit ourselves to one-sided views of the disease we can be reasonably sure of success in controlling it.

WHAT DO WE KNOW ABOUT BERIBERI?

(1) We know that cases to which the name beriberi has been applied show a great variety of manifestations. The disease group may possibly include a number of distinct diseases which we are not yet able to distinguish from each other.

(2) We know that the disease rarely, perhaps never, affects those who do not eat rice in some form, but it is possible that the disease may exceptionally attack persons who eat other food grains.

(3) We know that epidemic dropsy, which is usually regarded as a form of beriberi, affects persons who eat parboiled rice, but the vast majority of all cases of beriberi occurs in those who eat overmilled rice.

(4) The symptoms of the disease and the changes found in the body after death suggest that an active tissue poison has been at work.

(5) We know that rice is liable to changes during the time of storage. These changes may be of great importance, whether they are regarded as consisting of a loss of nutritive qualities in the rice or in the formation of an active poison.

(6) We know that a deficiency of vitamin B in the diet results in degenerative tissue changes in man and other animals. Avitaminosis will predispose to beriberi and will aggravate the disease when it occurs. Possibly some of the disease conditions which have been classed under the name beriberi may be due to avitaminosis.

Deficiency in available proteins, fats and phosphorous must also be taken into account in connection with beriberi and other dietetic diseases.

(7) We know that the disease has never been proved to occur among those persons whose rice is exclusively new and parboiled.

Braddon's assertion that it never occurs among persons living on new rice even if it is overmilled has not been satisfactorily disproved, but overmilled rice should not be employed as an article of food as it is deficient in other nutritive properties as well as in vitamin B.

THE PRINCIPLES WHICH SHOULD BE FOLLOWED IN MAKING RECOMMENDATIONS FOR THE CONTROL OF THE DISEASE

It is essential to recognise that we do not know definitely what is the cause of beriberi, and that we do not even know that it is one disease. We must take into account all the factors which are likely to be concerned in causing any of the forms of beriberi. If we adopt a one-sided scheme which is based on the dogmatic assertion that certain views of the causation of the disease are correct, we may be responsible for the lives of thousands of people. "Safety first" should be the guiding principle. Fortunately most of the recommendations which have to be made are simple and are such as would commend themselves from the point of view of preservation of the food supply in good condition and of maintaining the nutrition of the community, apart altogether from their bearing on the prevention of beriberi.

MEASURES WHICH CAN BE RELIED ON FOR THE PREVENTION OF BERIBERI

(1) The only kind of rice which should be eaten is fresh parboiled rice, such as is manufactured in numerous rice mills in Calcutta and such as is used by the villagers in Bengal.

(2) Special attention should be paid to the storage of rice, the rice should be stored

(a) For the shortest practicable time

(b) In dry, cool and well ventilated places, which should be thoroughly cleaned out after the old stock of rice has been used up. It is dangerous to go on adding fresh supplies of rice to a stock of old rice.

(c) When rice has to be kept for any length of time it should be stored in the form of paddy not as manufactured rice. Even paddy should be very carefully stored to prevent possible changes of a harmful nature from taking place.

(d) If beriberi appears, the supply of rice which has been in use previously by those who are attacked should be regarded as unfit for use, and the store-houses or receptacles in which this rice has been kept should be regarded as infected and as likely to contaminate any further supplies of rice which may be placed in them.

Other articles of food also should be stored under good conditions, apart altogether from

the possibility of their being concerned in causing beriberi

(3) Adulteration of wheat flour with rice flour should be looked for and if detected should be severely penalised

(4) When beriberi breaks out the victims and the other people in the locality should, if possible, cease to eat rice, they should live on a diet rich in fresh available proteins and in all the essentials of an ideal diet including vitamin B Milk eggs, meat, dal and fresh vegetables are of special value

(5) At all times the diet should conform to the teachings of modern dietetics, a sufficient supply of fresh proteins, fats, vitamins and phosphorus is essential The prevailing fault of the diet of people in Bengal is that it contains an excess of carbohydrates

(6) Systematic study of the conditions of manufacture and storage of rice should be undertaken and any defects which are noticed should be dealt with by legislation

For example the suggestion of Dr Heiser that a tax should be imposed on highly milled rice is well worth consideration, and a tax on rice which has been stored for long periods might also be imposed if it is found to be practicable

The most serious difficulty arises in connection with the middle class Bengalis who have a great aversion to new rice, not only do they dislike it but they also declare that it is indigestible They also have a great objection to replacing rice by wheat or any other foodstuff which is richer in proteids than rice

Considering the great importance of rice as the chief article of food in Bengal it is essential that this should receive the same attention as the water supply The rice of the villages of Bengal need not be interfered with, it is rarely unwholesome

(7) Further research is needed into the conditions under which beriberi occurs and into the reasons for the variations in the symptoms of the different types of the disease

(8) As there is no satisfactory evidence of the infectiousness of the disease no special measures directed against person to person infection are suggested, but it is obvious that in any family or institution general hygienic conditions require attention especially at times when any disease prevails

Summary (of both parts of the paper)

In the present state of our knowledge beriberi and epidemic dropsy cannot be distinguished from each other, and it is preferable to group them together under the old name beriberi, though there is no harm in using such terms as "the epidemic dropsy form of beriberi" or "ship beriberi"

Avian polyneuritis which is caused by deficiency of vitamin B has not been proved to be the same disease as beriberi It is not safe to assume that attention to the supply of vita-

min B is in itself a sufficient precaution against beriberi The known facts suggest strongly that a poison formed in rice under certain conditions of storage may be the essential cause of some forms of beriberi, and possibly of the disease in general

A programme for the control of the disease should take into account (1) the manner of preparation and storage of rice, and (2) the supply of a nutritious and well balanced diet containing a sufficiency of all the factors which are essential to the nutrition of the body

THE PHARMACOLOGY AND THERAPEUTICS OF BÆRHAAVIA DIFFUSA (PUNARNAVA)

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Historical and General—*Bærhaavia diffusa* or *Punarnava* has been in use in indigenous Indian medicine from time immemorial In Sanskrit it is called *Shothaghni* (cure for dropsy), in Hindi *Gadha-purna* or *Santhi*, in Mahratti it is known as *Ghichuli*, and in the Punjab as *Itst*

The Ayurvedic authorities recognise two varieties of this plant, the one with white flowers called *Shwethpurna*, and the other with red flowers, the *rakt-purna* In the Tibbi literature a third variety with blue flowers has also been described

The plant grows all over India as a common creeping troublesome weed, and is especially abundant during the rains It belongs to the natural order *Nyctagmeae* The roots are stout and fusiform and have a bitter and nauseous taste From the root numerous stems 2 to 3 feet long, slender, and covered with minute hairs are given off The stem is often viscid, glabrous, the leaves are thick, arranged unequally, green and glabrous above and usually white underneath The base of the leaf is rounded and subcordate, and the petioles are as long as the leaves The flowers are small and sessile, 4 to 10 together in small bracteolate umbels forming slender long-stalked axillary and terminal petals The fruit is oblong, dull green or brownish and about the size of a caraway bean.

Dhanvanthari described the white variety in *Nighantu* as possessing laxative and diaphoretic properties Its efficiency in oedema, anæmia, heart disease, cough and intestinal colic has also been mentioned by him The red variety is bitter and its beneficial effects in oedema, hæmorrhage, anæmia and biliousness have been extolled.

Rajmughantu, another authority, recommended it in diseases of the nervous system, and *Bhabaprakash* in heart disease and piles *Charka* used it in the form of an ointment in leprosy and skin diseases, and as a decoction in stone in the kidney and in oedema Local applications of the root paste have been recommended in oedematous swellings *Sushruta* mentions its use in snake poisoning and rat-bite infection. *Chakradatta* used it in the treatment of chronic alcoholism, and various other writers recommended it in phthisis, insomnia, rheumatism and diseases of the eye

The Tibbi writers lay stress on its use in asthma, jaundice and ascites and mention its diuretic properties. They also use it as a vermifuge and febrifuge, and in urethritis.

Chemical Examination —

The only reference to any chemical analysis of the plant is that given by Dr L. M. Ghoshal in "Food and Drugs" for October 1910, p. 80. He gives the following constituents —

- (a) A sulphate of a body, alkaloidal in nature
- (b) An oily amorphous mass of the nature of a fat.
- (c) Sulphates and chlorides and traces of nitrates and chlorates from the ash. The amount of alkaloidal matter is very small.

The sulphate of the alkaloid is described as small needle-shaped crystals, brownish-white in appearance when in mass. Its taste is nearly bland or very faintly bitter and resembles that of impure quinine sulphate. The yield of the alkaloid was 300 mgms of sulphate from 20 ozs of the original plant (i.e. 0.053 per cent.)

A detailed study of the pharmacological action of its active principles with improved apparatus was undertaken, and this necessitated a thorough chemical examination.

Some fresh plants were obtained but they were not enough to complete the examination, especially the isolation of a large quantity of the active principle for pharmacological tests. The main work had, therefore, to be done with the dried plants.

Preliminary Examinations —

A small quantity of the powdered plant was first extracted with Prohiss' fluid and tested with alkaloidal reagents. The tests being doubtful, about 1,500 grams of the dry powdered plant were completely extracted with alcohol in a copper Soxhlet extractor. As much as possible of the alcohol was recovered and the residue left overnight to crystallize. The following day a large mass of long needle-shaped crystals was found at the bottom. These crystals were decanted from the extract, washed with absolute alcohol, dried and weighed. The crystals were identified to be those of potassium nitrate and the weight was about 10 grams, i.e., very roughly (since some must have been left in solution) about 0.66 p.c. of the weight of the dry plant. Large quantities of KNO_3 were also isolated in later extracts.

The quantity of KNO_3 is quite significant, being rather uncommon, and apparently there is no reference to this in Dr Ghoshal's paper, although positive tests for K and Na and for traces of nitrates are mentioned. The presence of such a large proportion of KNO_3 , which might partly account for the diuretic action of the drug, suggested an estimation of the total K in it which was accordingly done.

The extract, separated from KNO_3 , was made slightly alkaline with NH_4OH and repeatedly shaken with chloroform. The chloroform was recovered and the crude alkaloid repeatedly extracted with dilute HCl and filtered. The acid filtrate was shaken with ether to free it from oily matter and then made alkaline with ammonia. The alkaloid was extracted with chloroform and after recovery of the chloroform the residue of alkaloid was weighed. The weight of the alkaloid (free base) amounted to 0.158 gram, i.e. about 0.01 p.c. of the weight of the dry plant.

For the estimation of potassium in the water soluble portion of the drug, 100 grams of the powder were repeatedly extracted with hot distilled water until the last extract showed no test for K by the flame test. The extracts were then concentrated and made up to 500 c.c. Of this 50 c.c. was taken in a weighed platinum crucible and evaporated gently to dryness and the residue burnt slowly to a white residue of ash. The ash was dissolved in hot water and after the necessary precautions to eliminate the other metals, the potassium was estimated by the chloro-platinate method. The quantity of K found was 2.48 p.c. of the weight of the original dry powder. As the ash determined amounted to 8.50 p.c. of the weight of the dry powder, the percentage of

K present in ash becomes 29.17 p.c. and that of K 35.14 p.c.

Taking the whole of K as KNO_3 , the quantity of KNO_3 in the dry powder amounts to about 6.41 p.c. But this is rather unlikely, being about ten times the KNO_3 that actually crystallized out (although more must have remained in solution and all the KNO_3 may not have been extracted in the original alcoholic extractive). It is probable that other salts of K are present and the quantity present as nitrates is much above the average found in common plants.

Calcium precipitants have been known to have an effect upon the renal epithelium as evidenced by a marked diuresis and so an estimation was thought desirable.

Twenty grams of dry powder were thoroughly extracted with hot water and the filtered solution made up to 500 c.c. Of this solution 100 c.c. was precipitated by a dilute solution of pure CaCl_2 until there was no more precipitation, and the precipitate thoroughly washed with water. The precipitate was then dried and weighed.

The mean of two experiments gave 0.2035 grams of Ca salts (i.e., 5.08 p.c. of the weight of the original powder) and the weight of Ca left in the CaO obtained by ignition of the salts was 0.0466 gram.

For *inorganic radicles* present in an extract, 100 c.c. of the aqueous extract were evaporated to dryness in a platinum crucible and carefully burnt to ash. This was dissolved in water and filtered. The solution gave tests for CO_3 , Cl , SO_4 , PO_4 , Na, K and Mg.

For detailed examination and separation of larger quantities of the alkaloid for pharmacological tests, 39 lbs. of the dry and ground *Punarnava* powder were thoroughly extracted by Messrs Smith, Stanistreet & Co. with alcohol and the extractive, freed from alcohol, sent to us. The extractive received weighed 1,193 grams, i.e. 6.74 p.c. of the original powder. The green pasty mass of extractive was repeatedly macerated with hot distilled water and the solution filtered. The neutral aqueous filtrate was concentrated to a small bulk and on cooling a large quantity (76 grams) of KNO_3 came out as long colourless needles. They were separated and the aqueous filtrate made slightly alkaline with NH_4OH and shaken repeatedly with CHCl_3 until no more alkaloid could be detected in the last CHCl_3 extracts. The CHCl_3 was recovered and the residue of crude alkaloid dissolved in dilute HCl . The acid solution was washed with ether to remove fatty matter and the ether extracts were washed with dilute HCl to recover any alkaloid thus lost. The acid solution was then made slightly alkaline with NH_4OH and repeatedly extracted with CHCl_3 . The residue of alkaloid obtained from CHCl_3 weighed 0.6877 gram of the base.

The aqueous solution (A) from which the alkaloid was isolated was kept for future work.

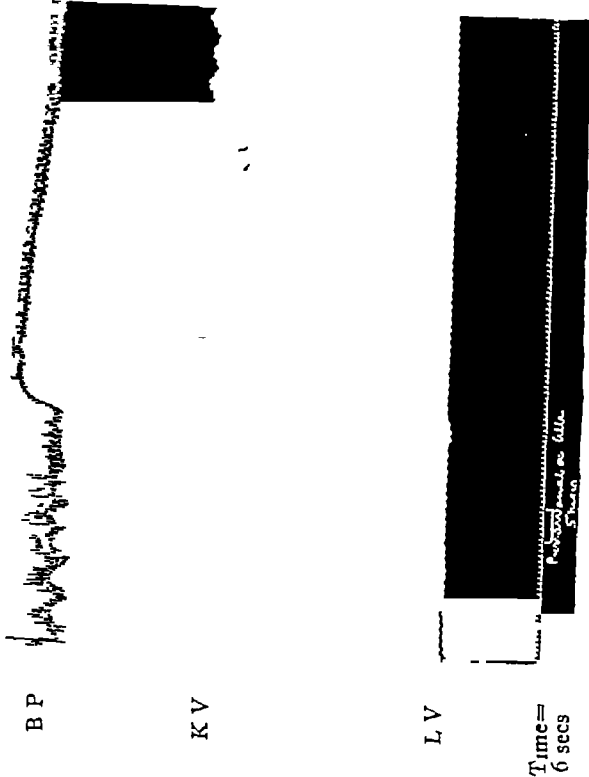
The original mass of extractive from which the aqueous extract was made was next repeatedly macerated with hot, very dilute HCl and the extract filtered. The combined filtrate was made slightly alkaline with NH_4OH and the alkaloid extracted with CHCl_3 and purified as before. The aqueous solution (B) left after the extraction of the alkaloid was kept apart. The weight of the alkaloid in this case amounted to 0.9381 gram. So the total weight of the alkaloid obtained was 1.6158 grams, i.e., nearly 0.01 per cent. of the weight of the original dry powder, as also found in the preliminary examination.

The alkaloid (base) has a very bitter taste and not "nearly bland or very faintly bitter" as described by Ghoshal. It was converted into a hydrochloride, and made up as a 2 per cent. solution of the base and used for the pharmacological tests. The solution gave all the alkaloidal tests and left on evaporation a very deliquescent residue of brownish-fern-shaped crystals. It is probable that the crystals described as "small needle-shaped and brownish-white in appearance" were contaminated with KNO_3 needles. The quantity of the

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Graph I



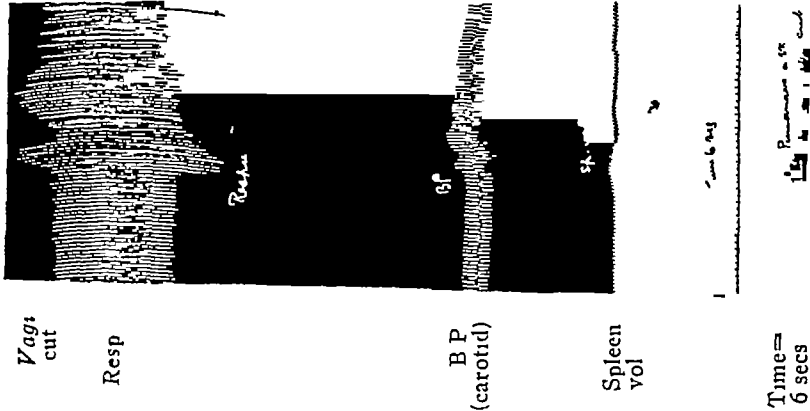
Blood pressure, (carotid) kidney and limb vols

Graph II



Deformed Trained IV

Graph III



Vag: cut

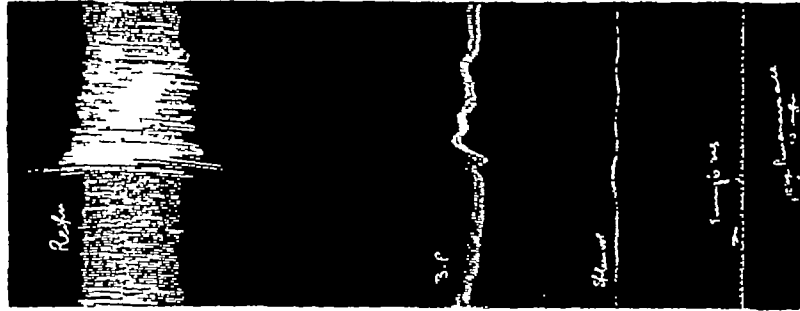
Resp

BP
(carotid)

Spleen
vol

Time = 6 secs

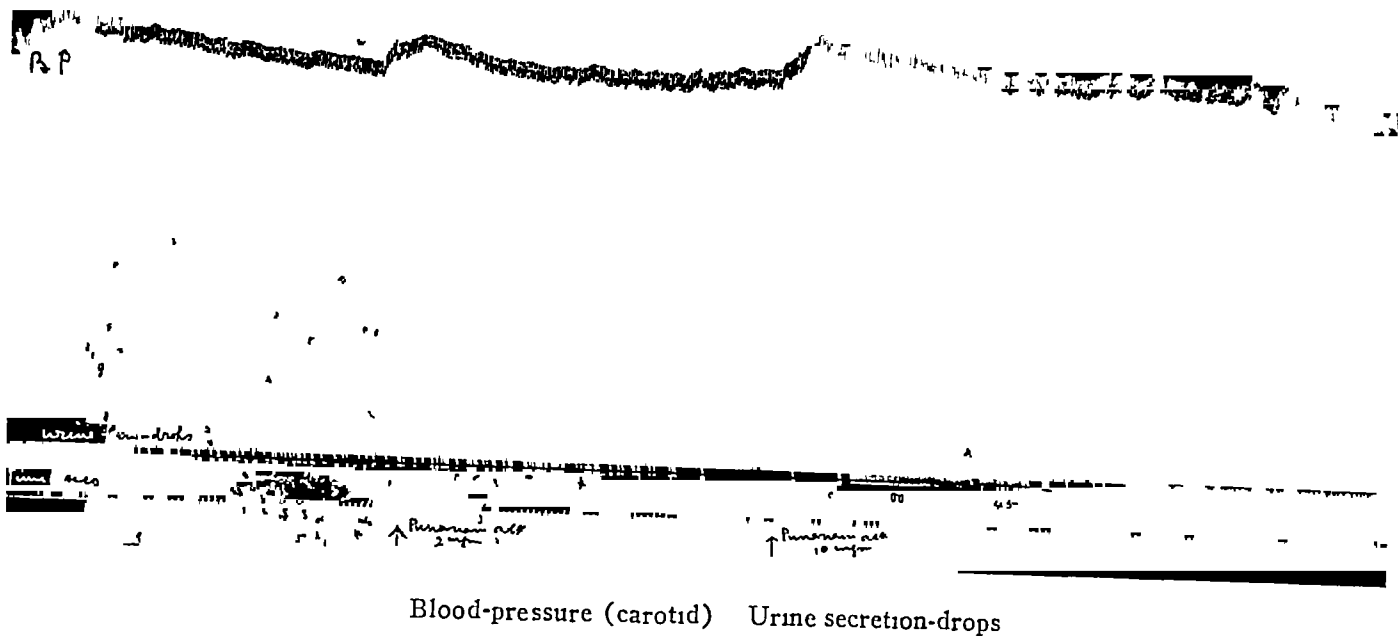
Graph IV



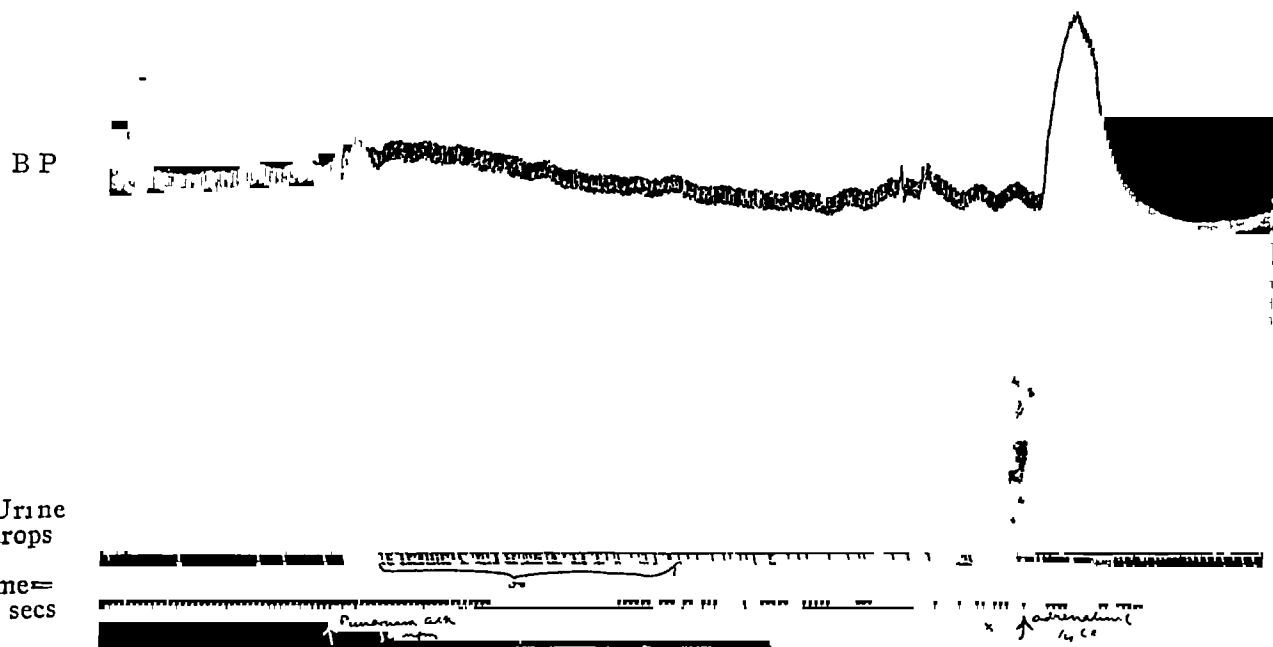
Vag: intact

Respiration, blood pressure (carotid) and spleen volume

B P.



Graph VI.



Graph VII.

B P



Urine drops

Time = 6 secs

Blood-pressure (carotid) Urine secretion-drops

alkaloid hydrochloride being rather small in amount, it was used solely for pharmacological tests

As no name has hitherto been given to this alkaloid, we have named it *punarnavine* after the plant which is known widely in Sanskrit and Bengali as *Punarnava*.

The aqueous solutions (A) and (B), from which the alkaloid was isolated, were mixed, made neutral and concentrated to a small bulk. Excess of neutral lead-acetate was then added and the precipitate (I) collected. To the filtrate basic lead-acetate was then added and the precipitate (II) collected. The precipitates (I) and (II) were then separately treated in detail to test for acid and neutral saponins, both of which were found to be absent.

The aqueous filtrate from the above precipitates were then freed from Pb by H₂S, the filtrate neutralised and concentrated. Another crop of KNO₃ crystals (38 grs) separated out on cooling. Thus the total weight of KNO₃ that crystallized out from the bigger lot was 114 grams, i.e. 0.64 per cent of the weight of the original dry powder. The concentrated aqueous solution was tested for glucosides, but they were found to be absent.

PHARMACOLOGICAL ACTION

To Dr Lal Mohan Ghoshal, of the Department of Physiology, Medical College, Calcutta, is due the credit for first undertaking the investigation of this drug. As this observer could not isolate a sufficient quantity of the active principle to test its pharmacological action, he used the crude extract in all his experiments. This for obvious reasons is liable to cause errors as the large quantity of nitrates, besides other salts of potassium, and various constituents, would mask the effect of the alkaloid and produce their specific effects on the tissues. Ghoshal's experimental work has been described in detail in "Food and Drugs" for October 1910 and his main conclusions were as follows—(1) The active principle is a diuretic, chiefly acting on the glomeruli of the kidneys, through the heart, increasing the beat and strength and raising the peripheral blood pressure in consequence, on the cells of the tubules it exerts little or no action, and if any, it is initial and comparative. (2) On the respiration it has little or no action and if anything it is probably due to the fatty principle formed in the weed. (3) On the liver the action is principally secondary and in combination with other drugs. (4) On the other organs the drug has practically no effects."

The experimental data given by this author do not seem to us to warrant some of the conclusions drawn. In all our experiments we used the hydrochloride of the alkaloid. The extracts made from the crude drug were used clinically, as a sufficient quantity of the active principle could not be isolated for therapeutic trial, and we quite realise that the diuretic effects may be slightly due to the potassium salts. Locally the alkaloid had no irritant action on the skin or mucous membrane. Subcutaneous injections did not set up any marked local reaction.

The Alimentary System—By the mouth, the liquid extract had very little effect on the stomach and the intestine. Large doses, even if continued for some time, do not produce signs of gastro-intestinal irritation.

The effect of the alkaloid was studied on the alimentary canal of intact animals and on isolated pieces of gut suspended in magnesium Ringer solution according to the technique described in Sollmann's Laboratory Guide. On the isolated intestine of the rabbit, dilutions of 1 in 100,000 caused a decrease in the tone and amplitude of peristaltic movements, the crude liquid extract produced no such effect. On the cat's intestine, the oncometer records showed no increase of volume or stimulation of peristaltic movements.

Respiratory System—The effects on the respiration were studied on the cat and dog, the animals being anaesthetised with ether or urethane. The respiratory movements were recorded by inserting a tracheal cannula and connecting it with one horizontal limb of a T-tube by means of a short rubber tube, the other horizontal limb being connected with the anaesthetic bottle and the vertical limb of the T-tube with the tambour recording on the kymograph. Intravenous injections of the alkaloid were followed by stimulation of respiratory movements, both the amplitude and frequency being increased. This effect was not altered by section of the vagi. There was no marked relaxation of the bronchial muscles, such as occurs with adrenalin, so that the drug in acute asthmatic attacks would be of no use in relieving the bronchial spasm present, (Graphs III and IV).

In none of our cases was there any evidence of expectorant action.

Circulation—The action of the alkaloid was tested on the isolated heart of the rabbit and cat, and on the intact heart of the turtle, cat and dog. If an isolated heart was perfused with solutions of concentrations of 1 in 5,000 to 1 in 10,000, such as can never be attained with therapeutic doses, the amplitude was diminished, both the systole and the diastole being affected. The force of the beat is weakened, the heart becomes irregular at first, the auricles and ventricles beat at different rhythms, there being two or three beats of the auricle to one of the ventricle. Soon the heart begins to beat regularly and the systole becomes forcible (Graph II). With weaker concentrations the latter effect predominated so that the net result was strengthening of the beat.

In the cat intravenous injections of 0.5 gm per kilo weight produced a distinct and persistent rise of the blood pressure (Graph I), in dogs similar injections caused a slight initial rise followed by a fall. Section of the vagi in neither case produced any effect, thus showing that the rise was probably not of central origin (Graph III). Plethysmographic observations showed that the peripheral vessels and those of the splanchnic area, with the exception of the kidneys, were not much affected. The spleen volume as recorded by an oncometer showed slight variations due to rise and fall of blood pressure, but the increase in volume was not so sustained as in the case of the kidneys (Graphs I, III and

IV) The rise of pressure was in all probability due to the direct action of the alkaloid on the heart muscle, but this point is still under investigation

With therapeutic doses in man, the liquid extract produced no rise of blood-pressure as observed by the sphygmomanometer. Most of the patients showed a fall of 4 to 6 mm of mercury in the systolic pressure.

Genito-Urinary System—The alkaloidal principle of *Punarnava* has very little effect on the uterus. Isolated guinea-pig and rabbit uteri were not affected even by such high concentrations as 1 in 5,000 to 10,000.

The diuretic effects were investigated on the cat and dog. As ether and chloroform are liable to cause suppression of urine, the animals were anaesthetised by giving 1 gm of urethane per kilo body weight followed by a few whiffs of ether. The flow of urine in drops was recorded on the kymograph by a specially arranged apparatus by either putting a cannula directly into the ureters, or into the bladder after resecting the pubic rami and cutting into the urethra at the base of the bladder. Injection of 2 mgms of the alkaloid intravenously produced an immediate and marked increase in the flow of urine. With 10 mgms the flow was even more marked (Graph V). To get comparative diuretic effects, therapeutic doses of caffeine were injected, the diuretic effect was not nearly so marked (Graph VII). That the diuresis is not entirely due to the rise of blood-pressure was proved by giving intravenously into the femoral vein $\frac{1}{20}$ th of a c.c. of 1 in 1,000 adrenalin. It was observed that although there was a much bigger rise of blood-pressure, the diuresis was comparatively slight. So that the effect must be largely due to the action of the alkaloid on the renal epithelium (Graph VI).

Toxic Action—That the alkaloid is not very toxic was demonstrated by the fact that 50 mgms given intravenously to a cat weighing $2\frac{1}{2}$ kilos and 20 mgms subcutaneously to a guinea-pig weighing 450 gms did not produce any serious symptoms. This was amply borne out by clinical observations on our cases in hospital, but the toxicity of the alkaloid is still under investigation.

Clinical Observations—The fact that most of the previous observers laid great stress on the diuretic properties of *Punarnava* and that these results were confirmed by animal experiments, led us to test the drug in cases of oedema and dropsy in man due to various causes. As a sufficient quantity of the alkaloid could not be obtained for clinical use we had to be content with giving the liquid extract kindly prepared by Messrs Smith, Stanistreet & Co., according to our directions. The extracts were made both from the dry and fresh plant (white variety) and we found them to be equally efficacious. The strength of the extract was 1 gm of the plant in 1 c.c. of 60 per cent alcohol and this was given in doses ranging from 1 to 4 drachms. The amount of the alka-

loid in such doses worked out to be 0.35 mgm to 1.40 mgm or roughly $\frac{1}{40}$ to $\frac{1}{160}$ gr. The total amount of potassium base (not salts) in similar doses would be 1.5 to 6.0 grs, and of this KNO_3 being $\frac{1}{2}$ to 2 grs. The drug has been tried in a series of 34 cases at the Carmichael Hospital for Tropical Diseases and at the Sambhoo Nath Pundit Hospital. It may be mentioned here that in the early part of this work, owing to the difficulty of obtaining good specimens of the plant, we had to resort to extracts obtainable in the market. These, however, did not yield satisfactory results.

The series of cases, though not very large, has given results convincing enough to enable us to form an opinion about the therapeutic properties of this drug. Excepting an occasional purgative no other drugs were given whilst *Punarnava* was being administered. In cases of ascites due to early liver and peritoneal conditions the drug appears to be very beneficial. It produced a very marked and persistent diuresis and in some cases the ascites entirely disappeared. The diuretic effect, though not so marked, was produced even when the abdominal fluid was not removed by preliminary tapping and the kidneys were working under a disadvantage. If, however, the tension inside the abdomen was high and the urine was scanty and albuminous, the drug failed to produce an effect unless the ascites was previously relieved.

A number of our cases were either complicated with kala-azar or the dropsical condition was possibly due to kala-azar. In such cases the improvement was not marked until the treatment with antimony injections was given simultaneously. It may be argued that the beneficial results in these cases were entirely due to the effect of antimony injections, but going through the notes of cases receiving this treatment we find that such marked diuresis is as a rule not caused by antimony alone. In some of the cases cited below the amount of urine was two to three times the normal quantity secreted in healthy individuals, and this increase was maintained even when the ascites and oedema had disappeared and after the antimony injections were stopped. Dr L. E. Napier informs us that ascites in cases of kala-azar is not a common condition and when it appears is usually terminal.

The drug acts best when the dropsical condition is associated with healthy kidneys as in kala-azar (cases 3, 4 and 5) or ascites caused by dysenteric conditions. Diuresis, though it does occur in cases with copious albumen, is often not as marked.

As regards dropsy due to cardiac conditions, we have not yet had the opportunity of trying the drug in a sufficient number of cases to justify forming any definite opinion, but so far as our observations go, its effect does not appear to be marked. In such cases the digitalis group of drugs are much more efficacious. In ascites with advanced structural changes in the liver, kidneys and peritoneum, only temporary benefit can be

No	Initials	Caste	Sex	Date of Admission	Disease	Urine (24 hrs) on admission, in ozs	Urine (24 hrs) on treatment with Punarnava, in ozs	Remarks and date of discharge
1	K	S	M	2-1-22	General anasarca unkylostomiasis dysentery	14	30-44	Relieved 22-3-22
2	S	I	M	10-2-22	Ascaris K A history of dysentery	7	No improvement with Punarnava 40-80	Improvement with other diuretics 22-3-22 Relieved 24-3-22
3	S	P	H	21-2-22	General dropsy unkylostomiasis history of dysentery	30	10-16	Left hospital 15-3-22
4	U	P	H	21-2-22	Ascaris chronic peritonitis history of dysentery	6	20-42	Relieved 16-5-22
5	T	N	H	13-3-22	General anasarca unkylostomiasis	2	30-54	Much improved 3-8-22
6	G	H	M	12-6-22	General anasarca ankylostomiasis	6	20-40	Much improved 6-7-22
7	S	H	M	12-6-22	Ascaris cirrhosis enlarged liver chronic nephritis	7	40-65	Anasarca disappeared 4-7-22
8	A	M	M	14 6-22	General anasarca and chronic nephritis	6	40-64	Much relieved 6-7 22
9	B	D	H	15 6 22	Ascaris K A oedema lower limbs diarrhoea, persistent	10	30-56	Ascaris disappeared 30-7-22
10	H	H	F	25-6-22	Ascaris cirrhosis of liver oedema of legs	4	50	Much improved 6-8-22
11	B	H	F	8-7-22	General anasarca (cardiac)	4	30-40	Left hospital 22-7-22
12	M	D	H	15-7-22	General anasarca (cardiac)	3	40-60	Ascaris disappeared 16-10-22
13	D	M	M	21-7-22	Ascaris ankylostomiasis chronic peritonitis	30	50-88	Ascaris disappeared 3-10-22
14	D	H	F	14 8-22	Ascaris cirrhosis of liver	16	30-62	Died 6-9-22
15	A	B	H	15 8-22	Anasarca malaria acute nephritis	18	With Digitalis 65-80	Much improved with digitalis 28-8-22
16	S	A	M	19-8-22	General anasarca (aortic)	20-40	With Digitalis 60-80	Ascaris disappeared 9-1-23
17	P	S	H	23-8 22	Ascaris K A	20	With Punarnava 16-48	Anasarca disappeared 25-9-22
18	M	H	M	31 8 22	Anasarca general (cardiac) secondary nephritis	8	With Digitalis 30-68	Ascaris and oedema disappeared 23-10-22
19	R	D	I	9 9-22	Neobritus malaria	32	50-62	Oedema disappeared 4-10-22
20	U	D	H	24 9 22	Ascaris K A oedema of legs	14	25-48	Ascaris disappeared 1-11-22
21	J	S	H	6 10 22	Ascaris and oedema of legs chronic nephritis	10	30-52	Oedema disappeared 29 10 22
22	R	H	M	18-10-22	General anasarca	4	22-38	Much relieved 27-10-22
23	T	M	M	20-10-22	Ascaris cirrhosis of liver	14	70-100	Ascaris disappeared 6-3-23
24	B	N	H	26-10-22	Ascaris K A dysentery	16	40-54	Improved 3-11-22
25	G	H	M	28-10-22	General anasarca chronic nephritis (secondary heart)	10	80-126	Ascaris and oedema disappeared 23-23
26	B	R	H	6-11-22	Oedema of legs and ascites history of dysentery K A	14	34-62	Much improved 2 12-22
27	A	M	M	25-11-22	General anasarca chronic nephritis	8	28-52	Oedema disappeared 21 12 22
28	B	K	G	8-12-22	General anasarca K A	12	20	Died 2 6 22
29	M	K	H	8-1-23	Ascaris chronic malaria, peritonitis history of dysentery	7	40-55	Anasarca disappeared Still in hospital
30	L	H	F	25-1-23	General anasarca K A history of dysentery	6	60	Ascaris disappeared 2 3 23
31	M	H	F	3-2-23	Ascaris anaemia of legs	9	No improvement with Punarnava Improved with Theophyllin and Scilla 54-88	Still in hospital
32	O	M	M	5-2-23	Ascaris chronic nephritis (secondary heart)	4	20-28	Left hospital Oedema and ascites disappeared 18-2-23
33	B	M	M	6-2-23	Ascaris and oedema of legs chronic nephritis	10		Improving Still in hospital
34	S	H	M	15-2-23	K A ascites history of dysentery			

CHART I

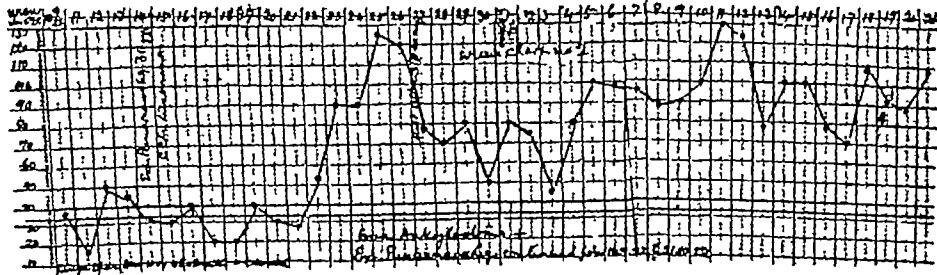


CHART II.

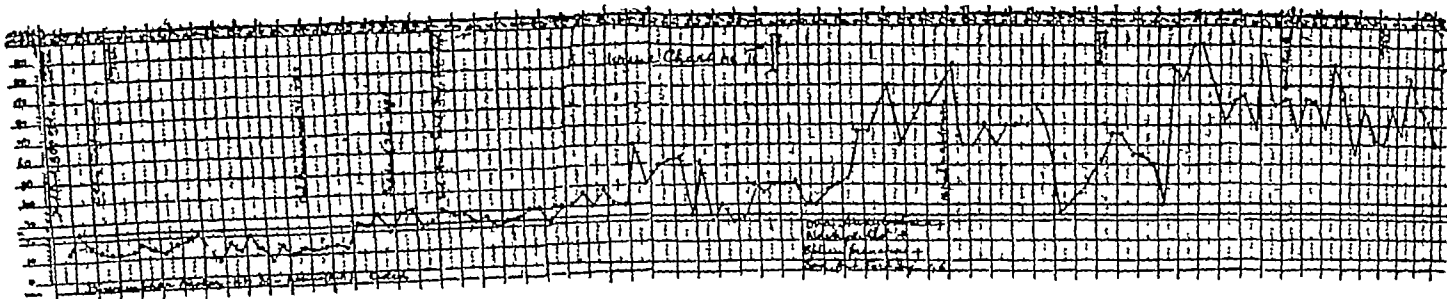
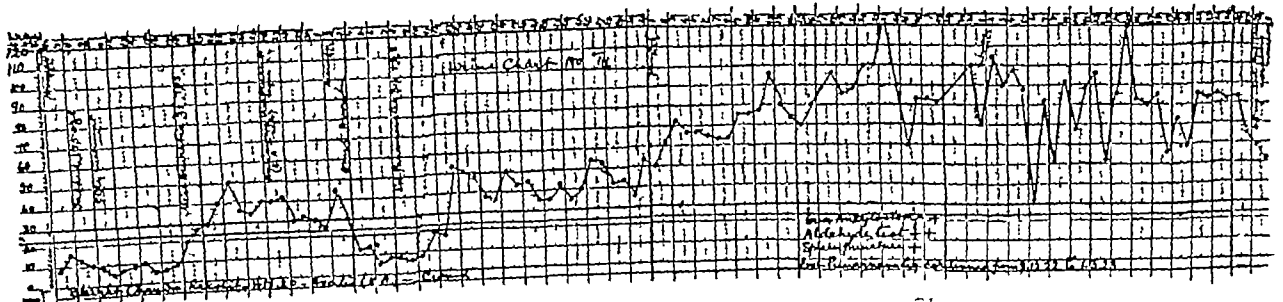


CHART III.



expected, but even in such cases the condition is greatly improved (cases 4 and 5)

Report on Cases—Owing to want of space it is not possible to go into details concerning all the cases which have been treated with this drug. A table is appended which at a glance shows the therapeutic effects produced in the different members of the series. We have also given detailed summaries of five cases, with three urine charts, which will help the reader to realize the diuresis produced and the beneficial effects on ascites. It will be observed that ten cases were discharged with no fluid in the abdomen and were apparently cured for the time being at any rate. These included some cases bad enough to be tapped regularly once or twice a month. We are trying to keep in touch with these cases and hope to communicate later the ultimate results.

Case 1—Rangadhar Das, male, aged 45. Admitted to the Carmichael Hospital for Tropical Diseases with general anasarca on 9th September, 1922. Abdomen much distended, previously tapped at Burdwan. Heart, second sound accentuated. *Ankylostoma* ova found in the fæces, treated with CCl₄. Spleen just palpable, liver normal. Anæmia and emaciation. Urine scanty, 20 ounces in 24 hours, copious albumen, no casts. Put on a high protein diet and *Punarnava* extract two drachms t.d.s. on 14th September, 1922. Urine increased on 11th October, 1922, to 130 ounces per diem. Œdema and ascites disappeared. (Chart 1). Discharged, cured, on 23rd October, 1922.

Case 2—Darsatulla, male, aged 30. Admitted to the Carmichael Hospital on 22nd July, 1922, with ascites and œdema of legs and fever, two months' duration. Spleen much enlarged, liver not palpable. Aldehyde test for kala-azar negative. Heart normal. Urine contained no albumen or sugar, quantity 10 to 30 ounces per diem. Put on *Punarnava* extract two drachms t.d.s., quantity of urine increased to 45 ounces but on 7th August, 1922, again decreased to 15 ounces. Abdomen much distended and patient very uncomfortable, 19½ ounces of fluid removed by tapping and *Punarnava* continued. Urine increased to 70 ounces on 16th October, 1922, patient discharged at his own request. Much improved.

Case 3—Peyari Charan Sircar, male, aged 40. Admitted on 23rd August, 1922, to the Carmichael Hospital. History of intermittent fever with rigors for several months. Abdomen enlarged for two months, œdema of the legs and feet. Spleen seven inches below the costal margin. Heart, systolic bruit at the apex and base, not conducted. Urine normal, quantity 15 to 20 ounces in 24 hours. Put on *Punarnava* extract on 28th August, 1922, one drachm t.d.s. On 2nd September, 1922, quantity increased to 37 ounces but no improvement in patient's condition, had to be tapped twice. Aldehyde test for kala-azar positive. Put on a course of antimony on 10th October, 1922. Rapid improvement. Urine increased to 100 ounces. Patient discharged from the hospital on 9th January, 1923, cured.

Case 4—Bishambhar Naskar, male, aged 30. Admitted to the Carmichael Hospital on 26th October, 1922, with ascites and œdema of legs, diarrhoea, debility and emaciation, duration three months. Tapped, 350 ounces of fluid removed on the day of admission. Spleen three inches below the costal margin, liver palpable. Aldehyde test for kala-azar positive and *Leishman* *Donovan* bodies found on spleen puncture. *Ankylostoma* ova found in fæces, treated with CCl₄. Urine, no albumen or sugar, quantity 10 to 15 ounces in 24 hours. Put on *Punarnava* extract on 18th November, 1922, urine increased to 30 ounces but abdomen filled up again. Tapped on 26th November, 1922, 260 ounces removed, antimony treatment started on 1st December, 1922, and *Punarnava* continued. Urine steadily increased

to 100 ounces per diem. On 17th January, 1923, no fluid in abdomen. Patient had 46 injections of sodium antimony tartrate and was discharged cured on 7th March, 1923. Diuresis still maintained on discharge although *Punarnava* stopped on 17th February, 1923 (Chart II).

Case 5—Bharata Chunder Rukshit, male, aged 20. Admitted to the Carmichael Hospital on 6th November, 1922, with œdema of legs and ascites, emaciation, three months' duration. Liver enlarged 2½ inches. Spleen down to umbilicus, hard, abdomen much distended. Heart irritable, second sound accentuated. Aldehyde test positive for kala-azar, *Leishman* *Donovan* bodies found on spleen puncture. *Ankylostoma* ova found in the stools, treated with CCl₄. Urine no albumen or sugar, quantity 10 to 15 ounces per diem. Abdomen tapped on 8th November, 1922, and 175 ounces of fluid removed. Diuretic mixture containing potassium citrate given, urine increased to 40 ounces per diem but came down to 12 ounces on 4th December, 1922, in spite of the antimony started on 26th November, 1922. Put on *Punarnava* extract 1½ drachms t.d.s. on 8th December, 1922. On 23rd January, 1923, urine increased to 126 ounces per diem. Kept well above 80 ounces up to the date of discharge, *Punarnava* being continued all the time (Chart III). Patient discharged cured of ascites on 3rd March, 1923. Spleen still much enlarged and liver palpable.

In a certain number of cases the quantity of urine decreased somewhat after prolonged administration of the drug for a period of 4 to 6 weeks and it was supposed that perhaps this was due to the toxic effect of the drug. To test this point we gave daily doses of 2 to 3 drachms of the extract t.d.s. for over 2 months to several cases. It was observed that the quantity of urine passed did not materially alter and in some cases the diuretic effects were maintained even after the drug was discontinued. In one case, the diuresis was maintained for nearly six weeks after the administration was stopped.

CONCLUSIONS

- 1 The active principle of *Bærhaavia diffusa* or *Punarnava* is a body of alkaloid nature which we have called *punarnavine*. There are also large quantities of KNO₃ and other K salts present in this plant.

- 2 Intravenous injections of the alkaloid in cats produce a distinct and persistent rise of blood-pressure and a marked diuresis.

- 3 The diuresis is mainly due to the action of the alkaloid on the renal epithelium, although the rise in blood-pressure may contribute towards it.

- 4 Clinically 1 to 4 drachms of the liquid extract made from either the dry or the fresh plant produce diuresis in cases of œdema and ascites, especially those due to early liver, peritoneal and kidney conditions. When the liquid extract is used the presence of a large amount of potassium salts no doubt reinforces the action of the alkaloid.

- 5 The drug appears to exert a much more powerful effect on certain types of cases of ascites, i.e., those due to early cirrhosis of the liver and chronic peritonitis (Hale White) than some of the other diuretics known.

Before concluding we wish to express our gratitude to Major H. W. Acton, I.M.S., for his

advice and help during the course of this research. It is regretted that owing to want of space it has been possible to reproduce only a few of the graphs illustrating the results obtained from the large amount of experimental work which has been done in this connection.

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END RESULTS IN INTRA-CAPSULAR EXTRACTION (SMITH'S)

By F F STROTHER SMITH, MAJOR, I M S,
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IN answer to a letter by Major R. E. Wright, I M S, in the *Indian Medical Gazette* of August 1922, I wrote that I would try and examine as many cataract patients as possible who had been operated on by me some years previously by the intra-capsular method and report on them.

During the past few months I have endeavoured to trace as many patients as possible who had intra-capsular extraction performed by me more than one year ago and especially those who were operated on as far back as 1912-13. The latter of course would be of much more scientific interest if they could be reported on in fairly large numbers, but unfortunately this is impossible and the reasons are obvious. Most patients suffering from cataract are very old and have not an anticipation of life of more than ten years at the time of operation. Indeed in the majority of patients I would put it as low as five years. Letters written to the homes of hospital patients I found were useless. Either the letter was not delivered owing to the death of the patient, or indeed, it may be of his whole family, from influenza during 1918-19, or if delivered was looked upon as a police ruse to entice him to Allahabad for some mysterious reason or other, or else the patient objected to spending the money on his journey. In the case of private patients I have been able to collect a few. What I have done is simply to keep a watch at the hospital for patients who returned to have the other eye operated on, or who came for treatment for other complaints, and secondly, to examine as many private patients as possible, who came to me have glasses fitted or for other reasons. As a fair number of patients included in the following list are Europeans and educated Indians, I think the results of these will be of more scientific value than in the case of the ignorant villager. Any one who has ever tried to fit a number of the latter patients with glasses will realize the difficulty of getting an accurate estimate of the

amount of vision they possess. It is difficult enough to estimate his refraction by retinoscopy, but when the actual lenses estimated are put before his eyes and he is asked to count Snellen's dots he will refuse to count in the hope that by so doing you will give him better glasses. As the number of patients I have been able to examine is not large, I propose to give in some detail the condition of their eyes, and at the end of another six months I hope to be able to publish a further series.

Before going into detail regarding these cases let me say that I am not publishing these cases with a view to justifying the Smith operation. The operation has long since justified itself, and I strongly doubt if more than one-tenth of the cataract operations in Northern India are done by any method other than the Smith method. By Northern India I mean the Punjab and United Provinces.

The position to-day as regards the operation for cataract is simply this — We have two schools, *viz.*, the Capsulotomy and the Intracapsular Extraction and modifications of each. There is nothing to be gained by one school who knows little or nothing about the other pointing out its defects. What we want in the interests of medical science is careful detailed reports on a sufficient number of patients operated on by *both methods* at least one year previously by competent surgeons of both schools. Large numbers cannot be reported on in detail, but if the condition of the eyes of educated patients are carefully reported on at least one year after operation, then I think we will get facts worthy of note.

Every one will agree, I think, that the ideal operation is complete removal of the lens in its capsule. Any part of the cataractous lens or its capsule left behind the pupil must interfere with sight. It must not be forgotten that the vitreous has its own capsule, the hyaloid membrane, which completely surrounds it. To leave behind any part of the cataractous lens to act as a support for the vitreous *during the operation* is another question, and there is little doubt that it does act as a support during the expression of the nucleus of the lens and the subsequent removal of cortical matter by irrigation or otherwise. It is very unfortunate that this membrane has to be "needled" so often after capsulotomy, because of course the "needling" must also tear the hyaloid membrane and produce scar tissue in it and in the vitreous also. In fact "needling" causes a lot of tissue disturbance. Major Wright in the Madras Ophthalmic Hospital report, 1922 agrees with me in this. He states — "Our experience has been from a study of pathological specimens that a very slight trauma to the vitreous is sufficient to produce opacities and proliferative changes which may go on to a complete shrinkage of that body, and we feel convinced that damage to any of those membranes which lie opposed to the limiting membrane of the vitreous body is liable to give rise to vitreous opacities."

This theoretical consideration is upheld by our comparatively small experience of vitreous bodies examined after removal of the lens in its capsule." It would have been more to the point if Major Wright had given us the results of his experience of vitreous opacities occurring after "needling," and if "needling" has not been done, the amount of opacity in the posterior capsule. He must naturally have a fairly large experience of the two latter conditions. In good hands the average loss of vitreous in the intracapsular operation is under 5 per cent and in all these cases there is a scar in the hyaloid membrane and in the vitreous and this scar (opacity) is in nearly every case at the level of the upper part of the wound. In other words it does not lie between the pupil and the retina. This is quite contrary to conditions after the "needling" operation. It must not be forgotten that vitreous loss occurs in the capsulotomy operation also, but it is not so likely to occur in the latter on account of the support given to the hyaloid by the posterior capsule of the lens.

Such an unscientific statement as the following is to be strongly deprecated by either school in the discussion because we know that vitreous escape occurs in both operations. Colonel Kirkpatrick writes in his book on cataract and its treatment, "It has been argued that vitreous loss does no great harm to the eye, but if the surgeon will put himself in the place of the patient and ask himself whether he would object to its occurrence in his own eye, there can be little doubt what his answer would be. One might as well put a similar question to a surgeon removing a thyroid gland as to whether he would object to having his recurrent laryngeal nerve cut or not, or to take a more extreme example—If Landru was asked during his trial whether he would object to being guillotined or not."

I quote the following from Lieutenant-Colonel Kirkpatrick's book—"Minor disadvantages of the intracapsular expression operation are that its successful performance requires the aid of a well-trained assistant and that it possibly demands more skill in the delivery of the lens than does a capsulotomy operation." I do not agree that these are minor disadvantages, indeed, I look on them as the greatest disadvantages that can be used against the operation. The percentage of loss of vitreous diminishes in proportion to the skill of the assistant in controlling the lids, etc. The success with which the iris can be replaced after the delivery of the lens depends to a very large extent on the skill of the assistant and in this way prolapse of the iris, and large drawn up U-shaped colobomata are diminished. Besides these considerations, and what is of very great importance in having a well-trained assistant, is that it gives the surgeon great confidence. Few ophthalmic surgeons have had better experience of the value of a well-trained assistant than myself. During the five years preceding the War I was fairly constantly being transferred from

one station to another and in each station I had to train a new assistant. During those years I reckon that my percentage of vitreous escape was between 5-10 per cent and of prolapse of iris about 14 per cent. Since Colonel Henry Smith left India I have had the good fortune to have obtained his assistant Nur Elahi, who was with him for over 20 years, as my private assistant. I have just gone through the operation register of the Cantonment General Hospital, Allahabad, and I find that in the last 100 cataract patients operated on by me with Nur Elahi as assistant, I had one small escape of vitreous and three cases of prolapse of iris. I admit at once that I have been very fortunate in these 100 patients. However, I can safely say that my percentage of vitreous loss since the arrival of Nur Elahi is well below 5 per cent.

Now as regards the skill of the surgeon, intracapsular extraction (Smith's) is a very difficult operation to learn, and there are many ophthalmic surgeons who will never be able to practise it successfully on account of the amount of skill required. The chief attribute is a good pair of hands and unfortunately all ophthalmic surgeons are not blessed with this attribute. I look on this fact combined with the fact that it is an operation which cannot be performed successfully from a written description as the greatest drawback to the operation. Escape of vitreous is not regarded by me lightly in any sense of the word. The resultant large "drawn up" coloboma and the scar tissue in the hyaloid and vitreous must not be regarded lightly. One of the cases detailed below had escape of vitreous. In the case of No 6 Ayah this happened at the operation 11 years ago. Still the sight is good and the patient has been doing her work with this eye since then. Where the capsule has burst during the extraction and it is found impossible to remove it on account of vitreous escaping at the same time, this I regard as very serious indeed. The presence of the remaining capsule stirs up considerable irritation with its consequent results. The chief point I wish to emphasise is that the success of the operation depends on the skill of the surgeon and his assistant. It might be said that this is so in all operations. It is, but not to the same extent as in the highly technical operation of intracapsular extraction where every detail of the technique is of the highest importance. In the October number of the *Edinburgh Medical Journal* in 1912 I wrote, "Extraction in the capsule is a very risky performance without the aid of a trained assistant, and those surgeons who attempt it will come to grief. It is unfair to the method and to the patient for any surgeon to attempt it without previously having been taught by an expert." I still hold these views and I think the cause of so much discontent with the operation in certain schools is that it is attempted from a written description without a trained assistant. Those who have thoroughly mastered the operation know its advantages, continue to practise it,

and patients flock to them in large numbers to have their cataracts removed

From a study of the cases detailed below it will be seen that the toilet of the iris is of the utmost importance, chiefly because of the large coloboma and adhesions of the iris to the upper sclero-corneal margin. During the past winter I have been able to obtain better results in this respect by doing a small iridectomy. In the accompanying illustrations will be seen the result of this practice. These drawings have been kindly done for me by Mrs H, who, I may say, knows nothing about ophthalmology, and has never seen a cataract patient before. I have simply deposited the patient on her verandah and told her that I wished the drawing to show the size of the pupil, position of the incision, scar, etc.

The eyes A and B were operated on in November 1922, C was operated on in 1912, D was operated on in December 1922. In order to do the small iridectomy I introduce the iris forceps into the anterior chamber and pick up the pupillary margin of the iris and snip off as small a piece as possible. The greatest care must be taken during this proceeding not to touch the capsule of the lens with the forceps.

(1) *W D S*—Both eyes operated on in the winter of 1910 by a civil surgeon in the U P who has since retired. Intracapsular extraction was performed in both eyes without iridectomy. I saw this man, aged 80, while visiting another patient in his house. I was unable to examine him ophthalmoscopically. He has been doing the book work of his banking business ever since the operation. He has got clear binocular vision and can recognise people at long distances. Both pupils central, regular in shape, and good reaction to light. No posterior or anterior synechia. Patient states that there are no "specks" in his vision either floating or stationary. When I first looked at this patient's eyes I thought the "Rawalling" operation had been done. This result is ideal.

(2) *B L*—Both eyes operated on 18th November 1912. Cataracts mature. Examination shows R E severe trichiasis and resulting ulceration of cornea. Fundus easily examined. Coloboma large but not drawn up. Vision = fingers at six feet. He refuses operation for trichiasis as he states he is too old and weak and has as much sight in the other eye as he wants.

L E Large coloboma but without any adhesions. All media perfectly clear. Fundus normal.

Vision = 6/15, with + (plus) 10, with his own spectacles which were supplied in 1912. It can be imagined what a state these lenses are in.

(3) *M L*—R E operated on in December 1912. L E operated on in November 1913.

In answer to a letter his relatives came to see me, and told me he died in 1918 of influenzal pneumonia. They state that up to the time of his death he did all his own book work in connection with his banking business.

(4) *M*—L E operated on 9th November 1913. Mature lens. R E previously lost after a "Rawalling" operation in the Bazar.

L E Vision = 6/20 with + 10 D without correction of astigmatism, a very stupid and feeble old man. There are no adhesions of the iris either in front or behind. All media clear except cornea which shows a small nebula over the nasal edge of the coloboma. Coloboma large.

(5) *I W*—European aged 55. Right eye operated on in November 1912. This patient came to me for operation for glaucoma in this eye. He had been given this opinion by two ophthalmic surgeons. I may say I

disagreed with this opinion and it is too long a history to go into here. I diagnosed retro-bulbar neuritis and put him on treatment. Vision on arrival = moving hand at 2 feet. After treatment for 14 days = fingers at 6 feet. Still under treatment. Tension taken by Schiotz tenometer = 40 with ophthalmoscope all media perfectly clear. Large coloboma. Fundus normal except optic disc, the centre of which is very injected. With transverse illumination there is a very small adhesion of the iris to the wound on the temporal side. Reaction of iris to light present but sluggish. Up till a year ago, he says his sight was "perfect" with this eye and he did his work as a station master with it until then.

Left eye Dense central cataract. Pupil reacts well to light. Periphery of lens perfectly clear. Iridectomy performed preliminary to removing the cataract next winter.

(6) *Aiah* aged 70. Right eye operated on 24th November 1913. Vision = 6/10 with + 10 D.

The accompanying drawings C D show the position and shape of the pupil. Ophthalmoscopically media perfectly clear and fundus normal. Transverse illumination shows that the iris is adherent to the posterior surface of the wound at both corners. There was slight escape of vitreous in this eye (C) but I have been unable to see any scar or opacity in the vitreous or hyaloid. This old woman has been doing all her household work with this eye since 1916, when the left eye became cataractous. She does her sewing, etc and threads her own needle. As she lives in my compound I know all about her. I removed the cataract from her left eye in December last. See illustration D. She has also got adhesions of the iris to the back of the wound in this eye, but there was no escape of vitreous. She was a highly nervous patient, and it was with great difficulty that I tried to replace the iris after operation.

(7) *Mrs H*—European, aged 63. Right eye operated on in 1914. Left eye operated on in June 1922.

Right eye vision = 6/9. Coloboma large but no adhesions. There are a few floating bodies in the vitreous but she states they don't worry her unless she is ill. Fundus normal and other media clear.

The vision in the left eye is equal to that in the right eye and she has binocular vision.

(8) *Mrs P*—European. Right eye operated on in January 1921. Immature cataract. No complications at the time of operation or afterwards. I have not seen this patient since 1921 but her husband writes to me occasionally and I have just heard from him asking me to remove the cataract in the left eye. He informs me that ever since the operation she has been doing all her house work, needle work and writes and reads her letters with the eye. The cataract in the left eye is evidently mature as at the time of operation. On the right eye it was pretty opaque.

(9) *I W*—European. Right eye operated on 8th February 1921. No complications at the time of operation or afterwards. Vision = 6/6 with difficulty, 6/9, very good sight and can read J 11 with ease. Fundus normal and all media clear. Coloboma is somewhat large but no adhesions of the iris either in front or behind.

(10) *A J K*—Sub-Assistant Surgeon. Right eye operated on in 1916. Vision with + 9 D = 6/9 with ease. No adhesions of iris. Fundus normal. All media clear.

(11) *M S*—Right eye operated on in December 1921. Vision = 6/6 with + 10 and stenopaic disc. Coloboma large but not drawn up. No adhesions of iris. Media clear. Fundus normal.

(12) *B*—Right eye operated on 20th November 1921. Vision = 6/6 with + 10. Coloboma large but not drawn up. No adhesions of iris. Media clear. Fundus normal.

(13) *S*—Both eyes operated on 22nd December 1921. Vision = 6/6 in each eye with + 10 D. Coloboma in right eye is "keyhole" in pattern. Coloboma in left

eye is larger but not drawn up. No adhesions of iris in either eye. Media clear. Fundi normal.

(14) *P*—Both eyes operated on 23rd December 1921. Vision with + 10 D in each eye = 6/6. Both pupils keyhole in shape. No adhesions of iris either in front or behind. This is one of the best results I have seen after the Smith operation.

(15) *M*—Both eyes operated on 22nd December 1921. Age 60. Vision = 6/9 in each eye with + 11 D. Colobomata small. No adhesions of iris. Media clear. Fundi normal.

(16) *H*—European aged 70. Right eye operated on 3rd January 1922. No complications at the time of operation or afterwards. Vision = 6/9 with + 10 D and can read J II with + 13 D. Coloboma large. No adhesions of iris. Media clear. Fundus normal. Still doing his work on the staff of a newspaper. Left eye cataractous.

(17) *B*—Right eye operated on 3rd March 1922. Vision = 6/6 with + 10 D. Coloboma medium sized. No adhesions of iris. All media clear. Fundus normal.

PLATE I

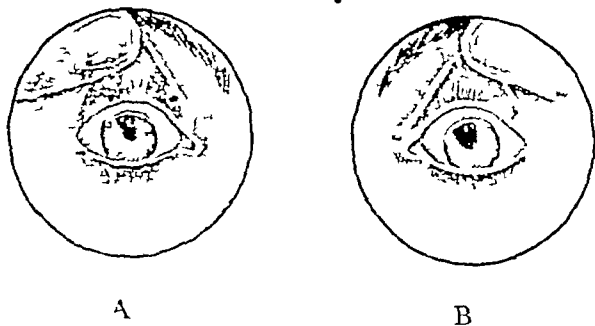
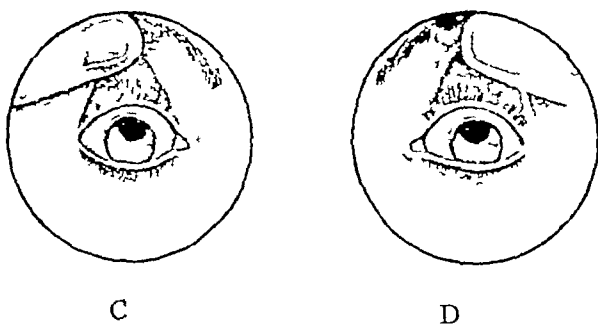


PLATE II



The illustrations A B C D

A and B are drawings of the eyes of a patient operated on four months ago. A shows the type of pupil I am in the habit of obtaining by doing a small iridectomy.

B is a somewhat larger pupil. It might be thought that the iris was adherent at the nasal corner of the wound but this is not so. The vision in both these eyes = 6/6.

C and D are eyes of No. 6. Ayah.

In the right eye there was a slight escape of vitreous but it will be noted that she has still good vision. Left eye, no escape of vitreous.

I have given the latter drawings in order to show the type of coloboma in a case of escape of vitreous (C) and in (D) where the iris could not be properly replaced and is adherent to both corners of the wound.

A NOTE UPON SPLEEN PUNCTURE FINDINGS IN MALARIA

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and

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A paper read at the Medical Research Section of
the Indian Science Congress, Lucknow,
January 1923.

Now that the earlier views of Schaudinn (1902) on malarial relapse as being due to a production of merozoites by parthenogenesis on the part of the macrogametocytes,—(a process which, even if it existed, would be strangely anomalous from the protozoological point of view),—have been shewn to be entirely erroneous by J. D. Thomson, (1917), the problem of the true etiology of relapse in malaria remains to be solved.

With a view partly to obtaining light upon this problem, partly to test its value as a diagnostic procedure, and partly also to study the process of destruction of malarial parasites, we commenced in October 1922 to spleen puncture all cases of malaria admitted to the Carmichael Hospital for Tropical Diseases with enlarged and hard malarial spleens. In all 15 such cases were spleen punctured during the subsequent two months, including cases of benign tertian, quartan, and malignant tertian infections. The slides were stained by Leishman's stain, and were most carefully studied.

Results

It was soon evident that spleen puncture is a method of no diagnostic value in chronic malaria. Occasionally in splenic films one may come across a crescent of *P. falciparum*, where examination of peripheral blood films has been negative, more frequently the presence of abundant hæmazon pigment may give evidence that the case is one of malaria, yet few if any viable parasites are ever encountered in such films in afebrile and relapsing cases. Whereas spleen puncture is the readiest method of diagnosis in kala-azar, it is of little diagnostic value in malaria.

Where viable forms are encountered they are occasional trophozoites within the erythrocytes, and, with the exception of gametocytes, which seem to be less numerous in splenic films than in films of the peripheral blood, no other viable forms are encountered. What the films do show, in abundance, however, are parasite forms lying free in the plasma and undergoing degeneration.

It has usually been held that malarial parasites are destroyed in the body by a process of phagocytosis on the part of the macrophages, large hyaline mononuclear leucocytes and endothelial cells. We have been quite unable to confirm this view. Examination of the spleen films shews that only such parasites as are extracellular, and have been swept off the surface of the erythrocytes and caught in the meshes of the splenic pulp are destroyed. The stages seen are—(1) Early destruction of the parasite chromatin by chromorrhexis and chromatolysis. (2) After

this the parasite cytoplasm becomes vacuolated and is destroyed by cytolysis, so that parasite forms are seen which are devoid of chromatin, but which can be identified as degenerated malarial parasites by the presence of hæmozoin pigment (3) At this stage the degenerating masses of parasite cytoplasm appear to tend to adhere together in the intracellular spaces, where we meet with sheets of degenerated parasite cytoplasm studded with hæmozoin pigment (4) Finally the cytoplasm also goes to pieces, free hæmozoin pigment is left, and this is phagocytosed by the macrophages and endothelial cells Spleen puncture films in malaria are often very pretty studies of such "pigmented mononuclears"

The Etiology of Malarial Relapse

Many different views as to the true etiology of malarial relapse have been put forward that there may be special and as yet unrecognised parasite forms especially associated with relapse, that the parasites may survive by finding their way out of the blood stream into endothelial cells and therein assuming a resting phase, that the parasites may retire into special visceral areas where they are relatively safe from destruction

We cannot see the necessity for the assumption of any such theories, and our spleen puncture findings fail to shew any such special and as yet unrecognised forms, or any evidence of any process other than destruction of parasites going on in the spleen Liver puncture was carried out on a case of relapsing quartan malaria, and here the findings were again similar to those in the spleen The spleen appears to function as the great site of destruction of parasites, and in no way as their reservoir, multiplication by schizogony appears to be restricted to the interior of the erythrocytes, either in the peripheral or in the internal circulation

It has been estimated by Ross and David Thomson (1910) that the "dose" of trophozoites necessary to produce the clinical febrile symptoms of malaria is approximately 250 million parasites It is also held in connection with *P. vivax* that the mature schizont produces about 20 merozoites, although we have found experimentally that this figure is too high, and that a mean of 14 merozoites is nearer the mark Taking the above figures at 250 million and at 20 merozoites per schizont, however, then the progeny of a single injected malarial sporozoite of *P. vivax*, if its schizogony were to proceed uninterruptedly, should be 512 millions on the 18th day after infection, by the 22nd day 204,800 million malarial parasites should be present in the patient's circulation, and the patient should be dead As, however, the tendency in even untreated cases of malaria is towards spontaneous—even though temporary—cure, it is obvious that there must be a tremendous destruction of parasites in the body, and this takes place in the spleen, possibly also in the other internal viscera Parasites which have entered into the erythrocytes are safe from destruction, and with them schizogony pro-

ceeds undisturbed Parasites which, for any reason, fail to penetrate into the erythrocytes are swept off into the plasma, are caught in the meshes of the spleen pulp and there destroyed by chromorrhexis, chromatolysis and cytolysis Also, as the patient becomes resistant to the infection, gametocyte formation sets in, every trophozoite which becomes a gametocyte represents a non-multiplying form introduced into the parasite population, and the formation of gametocytes exerts a brake-like action upon the schizogony cycles

The rate of destruction of parasites, even in untreated cases of malaria, must—indeed—be tremendous If we take the above figures for a benign tertian infection of production of 20 merozoites per 48 hours by each schizont, and an approximate number of 512 millions in the circulation at the 18th day after infection, and disregard the brake-like effect of gametocyte production, then, for *P. vivax* infection, a destruction rate of not less than 98 per cent per 48 hours would be necessary to effect spontaneous cure

If only 90 per cent of parasites were destroyed per 48 hour cycle, then at the 20th day the position would be 461 million parasites destroyed, 51 million left, the progeny of this 51 million would be 1,020 million in a further 48 hours, and fever would continue If 95 per cent were the destruction rate then at the 20th day 486 million should be destroyed, and 26 million be left, and their progeny in a further 48 hours should number 520 million, a dose still sufficient to cause fever If 98 per cent are destroyed, however, then of 512 million parasites present, 502 million would be destroyed, and only 10 million left, and their progeny would only number 200 million in the next 48 hours, a dose insufficient to produce fever

In brief, therefore, we consider that there is no necessity to postulate either special parasite forms associated with malarial relapses or to assume the passage of parasites into either safe areas or into a resting phase We consider that the etiology of malarial relapses may be explained upon a purely mathematical basis If the patient's powers of resistance are such that 98 per cent of *P. vivax* parasites, for instance, are destroyed per 48 hour cycle, then cure, and probably permanent cure without relapse, is assured If the destruction rate is lower, and at a figure of only 90 to 94 per cent, the disease is still in its progressive phase At a figure between 95 and 96 per cent a condition of balanced equilibrium is reached at which schizogony is still proceeding at the normal rate, but the patient's powers of resistance are sufficient to keep the total number of trophozoites below the febrile threshold, whilst the brake-like factor introduced by gametocyte formation is also important in reducing the infection to afebrile limits Should the patient's powers of destruction of merozoites become reduced from any adverse or extraneous cause, however, the destruction rate will fall,

the schizogony success rate will be proportionately greater, a febrile dose of merozoites result, and fever recur

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A Mirror of Hospital Practice.

A CASE OF INTESTINAL OBSTRUCTION COMPLICATED BY TETANUS

By F J W. PORTER, D.S.O.,

MAJOR, R.A.M.C. (Retired).

Mrs Y, aged 32, sent for me on July 18th about 1.45 p.m., having been advised to come into my nursing home. There was a history of increasing difficulty in getting her bowels to move for over a year. She had acute intestinal obstruction with frequent vomiting, and the distension of the abdomen was enormous. I did not wait for an ambulance but had her placed in a taxi and removed from her hotel at once, picking up a medical man as my assistant en route. On arrival and before taking her out of the car, I gave one tabloid of hyoscin compound hypodermically.

At 2.15 p.m. I gave spinal analgesia and opened the abdomen in the middle line after previously injecting novocain and adrenalin into the line of incision. I found a hard growth in the bowel at the junction of the sigmoid and rectum which had constricted the gut as though a string had been tightly drawn round it.

The whole of the large intestine and a good deal of the small was hugely distended and appeared likely to burst, so the first thing I did was to incise the sigmoid through a band and give exit to gas and faecal matter. After emptying as much as possible, the small incision was closed and I adopted a similar procedure in the transverse colon and caecum. The appendix being diseased was removed. The bowels were replaced and the upper part of the wound closed. The sigmoid just above the growth was sutured to the parietal peritoneum in the lowest part of the wound and a purse string suture placed in the bowel. I had hoped that I had emptied the whole of the large bowel and did not therefore clamp it above the intended site of incision. As soon however as I had incised the gut inside the purse string, an enormous amount of fluid faeces escaped and it was fully 15 minutes before I was able to insert a large glass Paul's tube and tie the suture.

I had made no attempt of course to excise the growth and unite the bowel for, on account of the tremendous thickening and oedema of the wall of the gut, any suture would inevitably have become loose within 12 hours, with a fatal result from leakage into the peritoneal cavity. The patient slept throughout the operation and her condition at the end of it was extraordinarily good.

Great quantities of fluid faeces escaped into a kidney tray and it was at least 7 days before the bowels had fully emptied themselves. There was no difficulty in keeping the patient clean so long as the glass tube remained in the bowel, but after it had come out incessant labour was involved by the constant escape of fluid faecal matter into the cotton wool dressings. The diarrhoea which always ensues in these cases added to the difficulty.

Pituitrin in $\frac{1}{2}$ c.c. doses was given intramuscularly every three hours for the first three days and an injection was invariably followed by a large escape of fluid within half an hour.

Next morning I started continuous drip saline and glucose with brandy, but although my apparatus is a perfect one I could not succeed in getting the patient to retain it.

She now began to vomit in an effortless manner and obviously had post-operative hæmatemesis as well as some dilatation of the stomach. I therefore propped her up and passed a stomach tube, giving exit to a lot of gas and a great deal of dark fluid. The stomach was washed out with hot bicarbonate of soda solution until the washing became clear. The vomiting ceased at once and she became quite comfortable. After 12 hours it returned and I repeated the washing. Next morning she was vomiting again, but as she dreaded the passage of the tube, I allowed her to drink large quantities of hot soda solution and wash out her own stomach in this way. Although the pulse remained of good volume and tension I thought it advisable to get fluid into her intravenously and gave her 2 pints of saline-glucose-brandy and adrenalin in this way. She was already so uncomfortable that I did not want to add to her troubles by giving it subcutaneously.

This was repeated three times in all and to the last lot I added a preparation named "New-Hormonal" which had been supplied to me by Merck & Co., in answer to my request for an intravenous purgative. I have been for many years seeking something which could be given in this way and every surgeon who does much abdominal work must long at times for something which can be relied upon to act on the bowels, in cases of post-operative distension accompanied by vomiting, in which it is impossible to give anything by the mouth and where it is of vital importance to get an evacuation.

In this case a large stool was passed within an hour after the remedy had been given and it seems fair to ascribe the result to its use. I have written for a large supply and shall record my results later.

She now became able to retain nourishment and appeared to be going to do well.

The lower part of the wound round the colostomy opening became badly infected and large sloughs of connective tissue had to be removed. They separated very quickly and the granulating surface was very healthy. On the 28th July she complained of some stiffness of the jaws, but as she had been rather depressed and hysterical for a day or two I did not attach much importance to this symptom.

Next morning, however, the rigidity was so marked that there was only a small gap between the teeth through which she took fluids with some slight difficulty. I had no doubt that she was suffering from tetanus and gave 3,000 units intravenously at once. Dr S. Judah, M.D., saw her with me and confirmed the diagnosis. He advised 6,000 units of serum night and morning intramuscularly and chloral and bromide by the mouth.

There was no stiffness of muscles in any other part of the body and no tetanic spasm. Rissus sardonicus was fairly well marked. The wound became dry and glazed, with no discharge of pus.

About 10-15 p.m. on the 30th, the spasm of the jaw completely relaxed and she expressed herself as very comfortable. The pulse was however falling and the temperature rising. The spasm returned at about 2 a.m. on the 31st. She was perfectly conscious at 2-15 a.m. and died quietly at 2-30 a.m.

Dr Judah writes—"I have not seen a single case of tetanus following an operation of this nature. I had under my care two cases of tetanus in which no wounds of any description had occurred to cause the disease, and though treated on the most approved lines they did not take a favourable turn till the bowels were repeatedly opened with large doses of mag. sulph. These two cases caused me to believe that the alimentary canal may harbour the organism, but I have no scientific proof for this belief."

A FATAL CASE OF CEREBRAL CONTUSION

By Dr A. C. SYAM, L.M. & S.,
Civil Surgeon, Sagaing

MAUNG THAIK, of Padu village, Sagaing District, was brought to the Sagaing Civil Hospital in an unconscious state with the left half of his body paralysed at 2-15 p.m. on the 8th April, 1922.

A contused wound was present on the left side of the head, said to have been received

in an assault committed with a stick, at about 2 a.m. on the same day, while he was under the influence of liquor. There was a contusion 2 in. \times $\frac{1}{2}$ in. round the wound, which measured $\frac{3}{4}$ in. \times $\frac{1}{4}$ in. \times $\frac{1}{4}$ in. and was situated on the left side of the head, above and a little behind the left ear.

The patient was quite unconscious, with the left half of the body paralysed and did not respond to questions. He had no bleeding from the nose, ear or mouth. The pulse was full and slow, pupils equal and not contracted and did not react to light. He passed urine involuntarily. The bowels were constipated.

Calomel was given and an ice cap was applied after shaving the head. A soap and water enema was given and he passed many scybala. As there was no improvement next day trephining was carried out on the right side of the head, as it was assumed that there was hæmorrhage on that side compressing the brain or bruising it by contrecoup—(as both the wound and the paralysis were on the left side). There was no fracture even on the right side, but the brain with its membranes did not pulsate, so a small opening was made in the dura mater, when some discoloured blood escaped through the rent and then the wound was dressed. No clot was found. On the third day his temperature was 99°F. He was semiconscious and could talk a few words when questioned. He could move his left arm and leg to a certain extent, but he passed urine on the bed involuntarily. 12th and 13th April. He was in the same condition, not appreciably improved. The wound was not healthy, and painful. He was still dull, but the left-sided paralysis passed off. 17th April. He was semiconscious but did not readily respond when questioned, talked with difficulty and hesitation.

As the pulse was full and bounding, venesection was performed and 6 oz. of blood withdrawn. 21st April. The patient became suddenly comatose with complete paralysis of both extremities, and died at 1 p.m. A post-mortem was held at 4 p.m. on the same day, 21st April, 1922. The body was fairly well nourished, muscular and strong. The deceased was about 38 years of age. The wound on the head was healing but the scalp at the site of the injury was much contused. On removing the skull cap the whole of the left hemisphere of the cerebrum was found compressed by a big blood clot under the dura mater weighing about 12 ozs. and extending to the left anterior and median fossæ of the base of the skull. The left temporo-sphenoidal lobe (superior) was lacerated to the extent of 1½ in. in diameter at the seat of the injury. There was no fracture of the skull. Nothing was found on the right side. No laceration or bruise was met with. No intra-cerebral injury was found. All the organs were found healthy, except for the

liver which was cirrhotic and hobnailed in appearance

Death was due to compression of the brain, resulting from the injury evidently inflicted with a blunt weapon. The blow dealt caused laceration and internal subdural hæmorrhage by rupturing the blood vessels on the surface of the brain, which proved fatal.

The wound was on the left side with paralysis on the same side. Consequently the inference was that the mischief was on the right side, but on trephining no fracture or blood clot was met with. On making a small incision in the dura mater a small quantity of discoloured blood escaped and his paralysis passed off. He was able to use his left extremities, he was semiconscious after operation and answered when questioned but did not talk voluntarily, so naturally I thought that he was improving, and did not suspect the presence of blood clot over the left cerebral hemisphere in the absence of any paralysis of the right side of the body.

The general rule is that the left side of the brain controls the right side of the body and the right side of the brain governs the left side of the body. In this case though the left side of the brain was compressed, the right side of the body showed no signs of paralysis except for a few hours before death. The question arises whether the hæmorrhage took place at the beginning or subsequently, on the night previous to date of his death.

As the patient was about 38 years of age, there was little likelihood of cerebral hæmorrhage, which is infrequent in youth, and generally occurs after 40. The post-mortem examination revealed no hæmorrhage in the substance of the brain and the colour of the blood clot was darkish and unlike that of a recent hæmorrhage. Even after trephining the man did not regain his full consciousness till death, which indicates that there was a certain amount of pressure on the brain existing from the beginning, particularly at the base of the brain. The clot probably dated from the time of injury.

In Osler's Medicine it is mentioned that the motor impulse from the left side of the brain causes contraction of the muscles of the right side of the body and *vice versa*. As a general rule, the motor path is crossed. The present case appears to be an exceptional one.

CYSTICERCUS OF THE SUBCONJUNCTIVAL TISSUES

By R. E. WRIGHT,

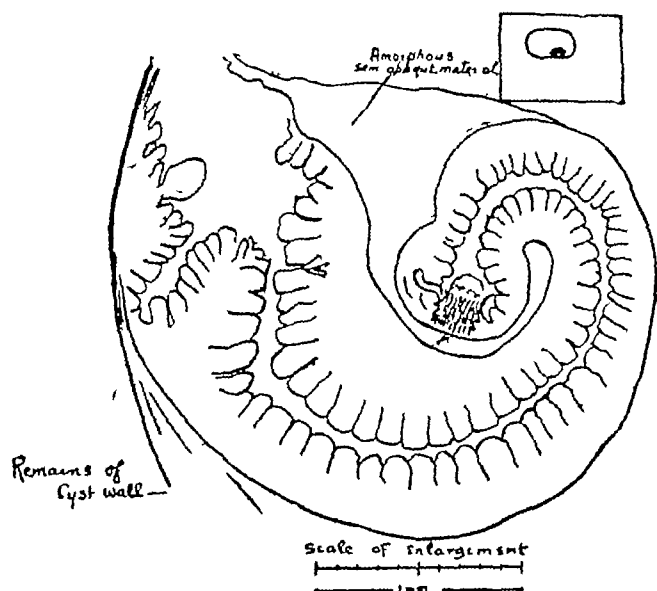
MAJOR I.M.S.,

Superintendent Govt Ophthalmic Hospital, Madras

N, age 10, was admitted to the Government Ophthalmic Hospital, on 6th June, 1922, on account of a small swelling near the inner canthus

of the right eye. It appeared to bulge more when the lacrimal sac was pressed upon, and a house-surgeon in squeezing over the inner angle caused the stretched conjunctiva to tear and "a little white sac to pop out". This was small, tense, cylindrical, about 2 cm by 1 cm, semi-opaque, and full of fluid. It showed a denser opacity at one point due to a nodular thickening of the wall. This nodule projected into the cyst. On opening it a milky fluid escaped which merely showed amorphous matter under the microscope. The nodular thickening (about 3 mm high) was nipple-shaped; no hooks were seen until the nodule was pressed upon by a needle and burst, revealing a typical head with four suckers and a slit-like marking surrounded by a row of hooklets (the actual number was not accurately determined). The specimens were sent to Colonel Elliot, Lecturer in Ophthalmology, London School of Tropical Medicine and received by Colonel Kirkpatrick, who was acting for him and passed on by the latter to Prof Leiper, Director of the Department of Helminthology, who reported that it was a *Cysticercus cellulosae*, the hooks on the head of which were very abnormal. The first case of *Cysticercus* of the sub-conjunctival tissues recorded in India is that published by Elliot and Ingram from this clinic in the *Indian Medical Gazette* for June 1911. It is quite possible that other cases have been met with since, but I cannot find them in our records. Cysts of the sub-conjunctival tissues are not commonly met with in the out-patient department of this hospital, certainly not more often than 3 to 6 times a year, but I imagine that if such cysts were always investigated with care, *Cysticercus* might be detected more frequently. However this may be, I have just come across another of about the same size and in the same situation. This *Cysticercus* presented the following features. The somewhat ovoid eminence on the inner side of the cyst in the undisturbed state was flattened from side to side and distinctly helicoid when viewed from the lateral aspect through the binocular microscope. The approximate actual size of the cyst and eminence is indicated in the illustration. Owing to its opacity, however, no detail could be made out, although it was certain that it was a *Cestode*. As it was fixed in formalin I decided to split it in its long axis in order to make sure. The drawing gives an idea of what was then seen. The neck is continuous with the boundary wall of a cavity, the lumen of which is almost obliterated by innumerable plications. The head folded in a curve on this sac is cemented to it by structureless opaque tissue which rounds off the whole. The sac is torn at its most expanded part. This tear was produced in separating it from the wall of the cyst to which it adhered at this point and into which it projected. This is indicated in the diagram. The head shows the circlet of hooks inverted. It was difficult to get accurate detail even under optimum conditions of illumination, as the head

parts were cut slightly bevelled. The outline was roughly prepared to scale and detail filled in from microscopic observations. It is therefore semi-diagrammatic and is merely produced to show clinical observers what to look for and to give an idea of size. No attempt was made to disturb



the specimen in order to get accurate measurements, as it was decided to hand it over to an expert. I have presented the specimen to Mrs Ware, formerly of the Helminthological Department of the London Tropical School, now at Madras, who has kindly volunteered to investigate it. Her detailed report will be published in the proper place and a résumé will appear in the annual report of the Government Ophthalmic Hospital for 1922. I must thank Lieut-Colonel Kirkpatrick for letting me have Prof Leiper's report on the first specimen.

A CASE OF FOOD SENSITIVENESS

By BIRENDRA MOHAN CHOWDHURY, I.M.S.,
Ghoramara, Rajshahi

THE following case presents certain unusual features, and the writer would be glad to receive suggestions as to its true etiology and treatment—

Boy aged 5½ years. Has suffered for the last 3 or 4 years from the following symptoms. At the end of or just after finishing a meal he feels chilly, has nausea, a tickling cough, running from the eyes and nose, highly congested eyes, itching all over the body and finally has eruptions which appear in order as follows—The first to appear is one on the anterior aspect of the left wrist, the second to appear is one over the outer end of the right supra-orbital ridge, and lastly over other parts of the body. These are oval, somewhat white, and hard to the touch and are just like the swellings produced by the bite of red ants. The boy is then put to bed and goes to sleep immediately. The eruptions after one, two or three hours disappear completely in the reverse order of their appearance. The boy then

feels quite all right. The condition usually occurs once in a month but once it occurred twice and at another time it did not occur for six months together.

The peculiar features of the case are—(1) The symptoms always appear in the same order. (2) They have no relation to the nature of the food as the condition has occurred with diets of rice and milk, rice and boiled vegetables, mixed diet of rice, pulse, vegetables, fish, milk. (3) The attack usually occurs during the day, only one attack so far occurred during the night. (4) The attack occurs just at the end of or immediately after a meal. It never occurs at any other time. (5) The first and second eruptions appear invariably over the same spots on the left wrist and the right supra-orbital ridge respectively. (6) At the time of the attack the boy goes to sleep immediately on being put to bed. (7) The boy's father at about the same age had similar symptoms up to the age of 6 or 7 years. General health fairly good.

AN UNUSUAL INFECTION WITH *BACILLUS PYOCYANEUS* SIMULATING LEPROSY

By Dr S MALLANNAH, M.D.,
Hyderabad, Deccan

A PATIENT, named Gopal Rao, aged 35, suffering from perforating ulcers of the foot for a period of one year, came to me for treatment. He had two perforating ulcers, one on the right heel about one-and-a-half inches in depth and the other on the second toe about half-an-inch in depth on the same foot. He had also white discoloured patches over the left cheek and on the outer surface of the left arm, on the outer side of the left leg and on the dorsal surface of the left foot. These patches were not anæsthetic. He also suffered from burning and tingling sensation in both feet. These symptoms resembled those of leprosy and in fact he was treated as such a case before I saw him, with gynocardate of sodium and sodium morrhuate without much benefit. He had no nodules on the face and the ears were not thickened. His ulnar nerve on the left side, however, seemed somewhat thickened. On examining scrapings from the ulcer I was not able to find lepra bacilli, but I found a large number of slender bacilli with rounded ends which on cultivation were found to be those of *Bacillus pyocyaneus*. I prepared an autovaccine of *B. pyocyaneus* from the patient containing one hundred million organisms per c.c. This was given subcutaneously every week. The ulcers completely healed after giving eight injections. The discoloured patches were due to *Microsporon furfur* and they cleared completely when treated with hyposulphite of soda. The burning and tingling sensation of the feet also disappeared under vaccine treatment and the left ulnar nerve now seems normal.

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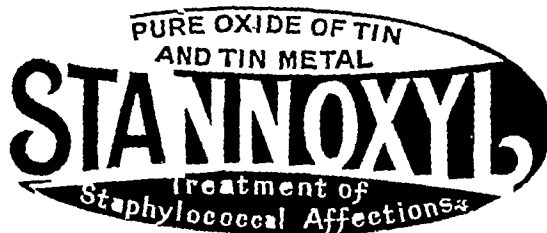
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"BAYER 205" IN KALA-AZAR

Ever since the discovery of the parasite of kala-azar it has been recognised that there is a relationship between kala-azar and sleeping-sickness, and it is natural that any drug which has given good results in cases of sleeping-sickness should be tried in kala-azar.

Probably the first occasion on which a trypanocidal drug was tried in kala-azar was about the year 1906 when two cases of kala-azar were treated by myself in the Ezra Hospital, Calcutta with a drug called 'arrhenal'. The reports of cures of sleeping-sickness by atoxyl had induced me to try to obtain a supply of the drug for trial in kala-azar, but the chemist to whom I applied informed me that none was available in Calcutta and he suggested arrhenal which was very nearly related to atoxyl.

The patients who were treated with arrhenal were two brothers and the results obtained were so striking that after a few weeks' treatment they regarded themselves as cured and insisted on leaving hospital in spite of warnings of the danger of relapse. A year later one of the two was seen by me and was in perfect health, but his brother had relapsed and died. Arrhenal was not further tested as I had no opportunity of treating any other cases of kala-azar till a few years later and in the meantime soamin had come into fashion. None of the arsenical preparations had any striking measure of success. Next came the antimony salts which were eagerly seized on by Italian and Indian workers on leishmaniasis and though these drugs are not ideal they have deprived kala-azar of most of its terrors for both patient and physician.

As soon as reports arrived of the remarkable success following on the use of "Bayer 205" in the treatment of sleeping-sickness an attempt was made by me to obtain some of the drug for trial at the Calcutta School of Tropical Medicine, but owing to the strictness with which the drug was guarded it was not until November 1922 that a supply was obtained from the makers who kindly placed a sample at my disposal.

Messrs Bayer made it a condition that no report should be issued without their consent and also that no analysis of the drug should be made. Dr Napier, the special research worker on kala-azar at the School, has now tested the drug in six cases and he will publish his results as soon as permission is obtained. In the meantime he will gladly give private information to any who have succeeded in obtaining a supply of the drug for trial.

Up till now two reports of the use of the drug in kala-azar have appeared. The first was by Dr Mollow, this was referred to in the January number of the *Gazette* and though the result was disastrous, the patient's condition was so bad when the treatment was started that little importance need be attached to the case. The next report is by Dr Warrington Yorke of the Liverpool School of Tropical Medicine, this appeared in the *British Medical Journal* of March 3rd, 1923. The patient was a lascar from Bengal who had been ill about three months before the diagnosis was made. His treatment for the first six weeks consisted of rectal injections of tartar emetic. During this treatment he steadily lost weight until a few days before the end of the course of injections when he suddenly began to gain weight. The gain was three pounds from December 16th to December 23rd, 1922.

The first dose of 0.25 gram of "205" was given on December 28th. The succeeding doses were one of 0.5 gram and two of one gram each given intravenously on alternate days. The result was very satisfactory as the patient left for India apparently quite cured within about a month of receiving the first injection of "205".

There is only one doubtful point in connection with this case. If a graph is made showing the patient's 'weight curve' as recorded by Warrington Yorke it will be found that the upward movement had set in before the treatment was started and that it continued afterwards at approximately the same rate as before. Those of us who have had much experience of kala-azar in the days before antimony was introduced are familiar with the occurrence of cases in which a sudden change for the better appeared, this was usually accompanied by a gain in weight and when this gain set in the prospect of rapid and

complete recovery was quite good, apart altogether from the use of drugs. The published cases leave us in doubt as to the value of the treatment and fresh evidence on the subject will be awaited eagerly. We are grateful for antimony but all the same we are on the look out for something better.

J W D MEGAW

PUNARNAVA

Elsewhere in this issue we publish a paper by Major R N Chopra, I M S, and his colleagues, which is a model of the type of pharmacological enquiry which is so badly needed in India to-day. *Boerhaavia diffusa* is a creeping and troublesome weed which grows abundantly throughout India. Under its popular name of *Punarnava* it has been used since time immemorial in the indigenous systems of medicine in India as a diuretic, expectorant, and in very many other ways. Lalmohan Ghoshal in 1910 made a preliminary analysis of the plant and tested crude extracts pharmacologically. He concluded that it was of considerable value as a diuretic and that its action was chiefly on the renal glomeruli, through the heart.

The case for *Punarnava* therefore seemed one worthy of study by more exact and critical methods. Major Chopra and his co-workers first made a careful chemical analysis of the leaves. The ash yields a very large proportion of potassium salts, and part of the diuretic action of the drug is possibly due to the presence of large amounts of potassium nitrate. On the other hand an alkaloid was isolated—punarnavine—amounting to 0.01 per cent of the weight of the dried plant. It was purified, crystallized out as hydrochloride, and pharmacologically tested by experiments on animals.

Punarnavine, as thus isolated, is an alkaloid of very low toxicity, and almost non-irritant, both by oral and subcutaneous administration. On the respiratory system it has little, if any effect. When given intravenously to cats it causes a marked and persistent rise of blood-pressure. This is accompanied by a very marked diuresis. As compared with the action of adrenalin, the rise in blood-pressure produced by punarnavine is not so high, but the diuresis is much more marked. The action is mainly due to direct action on the renal epithelium.

As tested clinically in Major Chopra's table of 34 cases, *Punarnava* has proved itself a new and valuable diuretic of a high order. It is not of the same value as the digitalis group in cases of œdema and ascites due to cardiac disease. But in the œdema and ascites of malaria, of kala-azar, in the very common ascites of India following on dysentery, in ascites due to hepatic cirrhosis, and above all in œdema of renal origin, its value is better than that of the digitalis group or caffeine and its allies. The drug can be given in doses of from one to three drams of the liquid extract over prolonged periods with safety and the diuresis often persists after the drug has been discontinued.

Further work upon the drug is of course necessary and clinical trials should be made with both the purified alkaloid and with standardized tinctures and extracts. Yet here at hand throughout India lies a cheap and plentiful source of supply of a new diuretic of proved value. The claims made for the drug as an expectorant, etc., cannot be substantiated, but its diuretic properties are proved to be of considerable value and have a wide range of applicability.

It is by work of this type that we hope to see some day established an Indian Pharmacopœia, depending mainly upon indigenous sources of supply for its materials, formulated and adopted to the special requirements of this country and bringing medicine and the healing art within the means and resources of the masses.

"THE BIOLOGY OF DEATH"

THERE has recently come into our hands a book which is of such absorbing interest, so brilliantly written and based upon so large an experimental and statistical basis that it deserves comment in our editorial rather than in our review columns.

Professor Raymond Pearl is well known as a disciple of Professor Karl Pearson and as a keen experimental biologist, but in this volume he outshines even the master himself. The philosophies speculate upon, rather than investigate death and, in the main, they are gloomy in their views. Thus in one of the finest passages in Eastern literature, in the book of the Third Darvesh in the 'Bagh-o-Bahar,' where the hero is being committed with the dead body of his wife

"The Biology of Death," by Raymond Pearl, John Hopkins University. J. B. Lippincott Company, Philadelphia and London, 1922, 275 pp., 64 illustrations, and complete bibliography, 10/6 net, *Monographs of Experimental Biology Series*.

and child to the tomb, the note is one of unrelieved pessimism —

An old priest in black,
Gem-studded vestments stepped up to my side.
The crowd made deep obeisance, and, all hushed, drew back.

Whilst in low murmuring tones,—like ocean's tide,
Which, rolling, fills the shore with voices,—he began —
'Man that is born of woman is a breath
That comes and goes is and is not. Beneath the ban
Of Destiny he moves 'twixt life and death
Human in form created in oblivion lost
Till, in another shape, he shall renew
His petty hopes and fears Nor shall he find rest
Until there breaks upon his gladdened view
The sight of that bright stream Nirvana, where is peace,
So long he lingers here' "

'Change and decay in all around I see,' laments the Christian hymnal. But of gloom and the philosophies Professor Pearl has nothing to say. His task is the more vital one of a keen investigation of the problems of longevity and old age.

He begins with certain general biological notes on natural death. The natural life span may be extraordinarily varied in any given species or race. There is no generally valid, orderly relationship between the average duration of life of the individuals composing a species and any other broad fact now known in their life history, structure or physiology. Natural death is preceded by the structural and functional changes which constitute senescence.

From this we come to his first essential proposition. Death is NOT the inevitable accompaniment of life, nor its natural termination. A *Paramoecium* divides at a certain stage of its existence into two; these later into four; these later into eight, and so on. Among the protozoa the 'tree of life' is an immortal one, with ever bifurcating branches. Accidents apart, there are here no graveyards and no corpses in the earliest forms of life; death is unknown. From the philosophical point of view we may here disagree with him, and claim that the division of one *Paramoecium* into two involves the loss of the individuality of the parent form, which is equivalent to its death. Biologically, however, and dealing solely with living cells, the point may be admitted.

In the metazoa matters are entirely different. In their higher orders male and female germ cells unite to give rise to the young life. The parents die; the somatic bodies of one generation have no continuity with those of another. The 'tree of life' is a narrowing one; in a few generations one has a multitude of ancestors; the way is littered with graves and deaths.

Yet, essentially the cells of the metazoal body are potentially immortal. In the case of the germ plasma Science admits this already. As Weismann pointed out as long ago as 1891 Science has its own conception of immortality. Sheltered within the somatic body lies the germ plasma. The somatic body dies but the life of the germ plasma is handed on to the progeny. The death of the individual is nothing; the continuity and immortality of the germ plasma everything. The glowing torch of life is never dimmed; it falls from failing hands only to be taken up and carried on by youth.

Nature, careful of the type, cares nothing for the individual life. And this conception of the immortality of the germ plasma is crudely recognised in life and in the philosophies. It explains the depth of mother love, the hold upon the imagination of ancestor-worship, even the selfishness of the crusty old bachelor and the unattractiveness of the old maid.

Will Science, however, not realise, asks Professor Pearl, that every living cell is potentially immortal? The work of Loeb and Lewis and others on parthenogenesis shews that the conditions essential to the continued life and development of the ovum outside the body are physico-chemical ones that the unfertilised ovum will develop into the normal embryo if certain appropriate physical or chemical stimuli be applied. The work of Loeb, Harrison, Burrows, Carrel and others has shewn that cells of practically every tissue of the living body may be artificially grown in vitro. Under proper conditions of environment these cultures of tissue do not die; they will even survive the life of the donor from which the tissue came. Burrows was able to demonstrate rhythmically beating activity in his cultures of heart muscle cells from the chick embryo. Carrel has a culture of connective tissue from a piece of chick heart which was nine years old in 1921. Essentially the tissues and cells of the metazoal body are just as immortal as are the non-cellular protozoa.

If so, then why does death occur? It is the price which the metazoon pays for differentiation of structure and specialisation of function. Death, so far from being inherent in nature, is a relatively late phenomenon in evolution. In the metazoon the differentiation and specialisation of function of cells and tissues in the body as a whole makes each system dependent upon the others; disturbed nutrition or environment leads to a break-down of one system and consequently and subsequently of the others.

With so much by way of preliminary the author turns next to a study of vital statistics, ancient and modern. We may plot the mortality per age in any population by plotting the average expectation of life at different ages. If this be done then every modern civilised country gives a very similar curve. Taking age as the horizontal, and number of years' expectation of life as the vertical axes, the curve starts low. Owing to infant mortality the average expectation of life at birth is only some 50 to 55 years. In childhood, however, the curve rises steeply and remains high; then thereafter declines slowly and gradually, until at 100 there is an expectation of only a few months.

As far as statistics are available, however, the curve in ancient civilisations was entirely different. It started low, and infant mortality in those days must have been excessive; the average expectation of life at birth in ancient Rome being only some 22 years. From this point the curve descends very gradually and slowly. At the age of 60 to 65 the curves for the ancient civilisations actually cross those for modern times and countries. The explanation is not far to seek. In those bad old days the men and women of 65 were the "toughs" who had survived the innumerable risks of war, famine, pestilence and plague. The chances of reaching 65 were far less than they are in present

days, but the exceptionally hardy survivors had every expectation of a prolonged and hale old age—it is quite probable that some of them survived to 150 or to an even greater age whereas the oldest age incidence that can be substantiated in modern times is 110 years and ten months. It will be seen that the different environments, ancient and modern, lead to entirely different expectations of life.

The modern 'life line' has been carefully analysed by Karl Pearson, who finds that it can be resolved into five different mathematical components. The symbolism of the Dance of Death is utterly wrong. "We see something quite different, the cohort of a thousand tiny mites starting across the Bridge of Life, and growing in stature as they advance, till at the far end of the bridge we see only the 'grey beard' and the 'lean and slippered pantaloons.' As they pass along the causeway the throng is more and more thinned: five Deaths are posted at different stages of the route. The first marksman concentrates a fire of unremitting destructiveness, killing before birth as well as after, beating down young lives with the bones of their ancestors—inherited syphilis and other pre-natal factors. The second at the entrance to life plays a machine gun. Only because the fire is so concentrated and narrow in zone are we able to pass through it without appalling loss. The third Death, who shoots at youth is a more playful marksman, with bow and arrow. The fire of the fourth is slow and scattered and not very destructive—such as might result from an old-fashioned blunderbuss. The last Death plies a rifle, and none escape his shots. He aims at old age but sometimes hits youth. His unremitting activity makes his toll large." Apt as is such an analogy yet the author doubts whether Karl Pearson's components really correspond to five real biological entities.

If we come to analyse the causes of death the vital statistics of modern countries are faulty from a strictly biological point of view, and Professor Pearl's first care is to attempt a biological re-classification of the available data. A series of curves follows of specific death-rates, at each age of life, from diseases of the cardiovascular system, the respiratory system, the primary and secondary sex organs, the excretory and renal organs, the skeletal and muscular system, the alimentary tract and metabolism in general, the nervous system and sense organs, the skin, the endocrine system, and a general curve for all together. A study of these shews a definite and orderly progressiveness. During the first year of life it is the alimentary tract and its associated organs whose break-down is chiefly responsible for the deaths; from 1 to 60 the respiratory system is the weakest and shews a higher mortality than does any other. From 60 to 90 the circulatory system becomes predominant. If our lungs were but as good as our circulatory system we should have every reasonable prospect of living a considerable number of years longer on the average than we now do.

These facts can be interpreted in terms of embryology. The embryo develops from endoderm, mesoderm and ectoderm respectively, and the different physiological systems can be referred each to its origin in one or other of the three layers. Man's greatest enemy is his own endoderm. His ectoderm has developed well, and

is but little concerned in the mortality. His mesoderm is of consequence only in old age also—to some extent in the female, in middle age—owing to disease of the female reproductive organs. But "the endoderm has been the least progressively changed in evolution, both structurally and functionally, and is the chief site of disease and the principal cause of mortality. It is an old-fashioned and ancestral relic which causes man an infinity of trouble. Practically all public health activities are directed towards overcoming the difficulties which arise because man carries about this antediluvian sort of endoderm. The heart outwears the lungs, the brain outwears them both. The workmanship of evolution, from a mechanical point of view, is extraordinarily like that of the average automobile repair man. If evolution happens to be furnished by variation with fine materials, as in the case of the nervous system, it has no objection to using them but it is equally ready to use the shoddiest of endoderm provided it will hold together just long enough to get the machine over the reproductive period." And since the systems are mutually interdependent, break-down of the endoderm is followed by break-down of the other systems, and by death. Had Nature only provided us with an endoderm as resistant and of as good wearing qualities as is our ectoderm, we should go a much longer way.

What is it that determines that John Smith shall die at 58, whilst his neighbour Henry Jones lives to the obviously much more respectable age of 85? There are two essential factors in this problem: the first the influence of heredity, the second that of environment. A life is like a wound-up clock. It starts with a certain amount of inherited energy potential. Here a statistical analysis of the figures gives results of extraordinary interest. The influence of heredity is enormous. As the age of the father at death increases so does the age at death of his children, especially that of his eldest son. The age of the mother at death is also important, but less so than is that of the father. In an analytical table it is shewn that it added almost exactly 20 years to the average duration of life to have parents living to an age of over 60, in place of parents who died at an earlier age. For an adult son the coefficient of correlation between son and father is 0.135 and for son and mother 0.131—small enough figures, perhaps, but with standard deviations of only ± 0.019 and 0.021 respectively, and undoubtedly indicating hereditary influence. And not only does heredity determine to a large extent the expectation of life, it also determines from a half to three-quarters of the selective death-rate by its influence upon the different physiological systems of which the body is made up. From the point of view of a hale and hearty old age the most important thing is to carefully select long-lived parents and grand parents! Unfortunately Nature, having made a muddle of our endoderms, has also rendered this desideratum impossible of achievement.

The influence of heredity is still further shewn by experiments on flies *Drosophila melanogaster*, the common "fruit" or "vinegar" fly, proved a suitable insect for study. Except that there was no infant mortality a study of experimentally bred flies shewed a curve of expectation of life very similar to that of man in modern times. Flies 90 days old were as decrepit

and senile as is a man of 90 in human society. Parent flies, the age at death of whose parents were known, were selected, placed in separate bottles, and their progeny watched. Flies who lived to old age gave broods which proved old aged; the progeny of short lived flies were also short lived. In brief everything goes to shew that, just as with the colour of the hair or eyes, duration of life is very closely bound up with heredity, and is inherited in accordance with Mendelian laws and distribution.

Thus the primary agent concerned in winding up the clock is one's ancestry. Yet it is not so much the actual duration of life which is inherited, as the actual total of energy potential inherited. The clocks from the same maker start all equally fully wound up; other factors may determine the rate at which they run down. Of two brothers one may dissipate his inherited total of energy potential far more rapidly than does the other; there is more meaning in the term a "fast life" than one had previously suspected. Environmental factors will obviously be here of importance, and Professor Pearl next goes on to describe an experimental investigation into the influence exerted by several such factors. It was found that flies bred in a sterile atmosphere and fed on only sterile food actually died sooner than did those reared in a septic environment; poverty exerts its influence indirectly and through other channels, rather than directly, upon the infant mortality, the correlation being insignificant. Temperature has an important influence, cold slows up the rate of living of the fly, heat hastens it. Under the influence of cold the rate of metabolism is reduced, the flies become sluggish, but live to a prolonged age. This factor helps to explain the reduced expectation of life in tropical countries. Rate of metabolism however affected, has an important bearing. Slonaker kept four albino rats in cages with revolving wheels, with controls in cages not so furnished. In the cages with revolving wheels the rats ran from 1,265 to 5,447 miles apiece,—the latter performance being rather a remarkable one,—and died at an average age of 29.5 months. The control rats lived to an average age of 40.3 months. Max Rubner, studying a considerable range of animals, finds that all transform approximately the same total amount of energy per kilo of body weight between birth and natural death. Small animals with an intensive metabolism live a relatively short time; larger ones with more sluggish metabolism live a longer time.

Rejuvenescence is next considered. Voronoff's work the author considers unworthy of consideration. Steinach's is better. Two rats of the same litter were taken both at the last stage of decrepitude, and 26 months old. They were so senile that photographs were considered unnecessary. One had the vas deferens ligated; the other served as a control. Three and a half months later the rat operated on was the picture of lusty young rathood and was in full vigour of every sort, including sexual. He survived his brother by 8 months. Yet this period does not exceed that possible for the normal rat, as shewn in Slonaker's experiments, and it is doubtful to what extent the subsequent hypertrophy of the prostate and seminal vesicles was due to stasis of the secretions. Other workers have advocated the

oral administration of tethelin, prepared from the anterior lobe of the pituitary gland, but it is doubtful to what extent such empirical measures can prolong life.

Public health measures during the last five decades are often quoted as shewing amazing results in saving life, and increasing the normal expectation of life. The author quotes an intense anti-malarial campaign in Crossett, Arkansas, as an instance. In a year after the institution of these measures, which aimed more at what was practicable rather than at what was ideal, the number of annual sick calls due to malaria in this lumber camp was reduced from 600 to 46 and a year later to 14. In Guayaquil six months of measures against yellow fever in 1918-19 exterminated the disease. Yet exaggerated claims only do harm to an undoubtedly sound cause. The mortality curves for four diseases, selected at random, where the decline may be attributed to improved public health measures over the period 1900-1919 were taken *viz.*, those for phthisis, typhoid, diphtheria and dysentery. All shew a sensible decline. But the four curves for four similarly selected non-preventible diseases, bronchitis, paralysis of non-specified causation, purulent infection and septicæmia, and cerebral softening shew an even greater decline. Further, public health measures tend to keep alive, not only the fit, but also the unfit; the latter to the detriment of the race.

The normal curve for the increase of population in any given country should conform to certain fundamental factors. At first the population is very low, and however rapidly it multiplies the total numbers are low; thus at its beginning the curve of increase keeps very nearly parallel to the horizontal axis. On the other hand, owing to failure of foodstuffs to keep pace with the growing population, or—in the last resort—to want of room in which to build, the curve must, at its end, be stationary and again parallel to the horizontal axis. Between these two ends there must be two intermediate phases: one in which food supply is in excess of population and the rise is rapid; one in which it is in deficit and the rise is less rapid. Professor Pearl accordingly calculates such a theoretical curve and shews with what extraordinary accuracy the population statistics for several civilised countries from 1800 to 1920 fit the theoretical curve. In the U.S.A. this period of history fits the steeply rising part of the curve; in France this period corresponds with the second phase of the increase; in Serbia it corresponds to a portion half in the rapid and half in the slower period of increase. In passing it may be noted how extraordinarily small are the flickers on these curves produced by both the Great War and by the recent pandemic of influenza. The figures for a fly population of *Drosophila* under controlled experimental conditions gave exactly the same type of curve, expressed in days in place of decades. In 1914 the population of the U.S.A. was 98,637,000; in the year 2,100 the curve shews that it should normally be 197,274,000. At this future period of existence the States will have ceased to be self-supporting in their food requirements. Much of civilised Europe is already utterly dependent upon external food supplies. Professor Pearl's figures are on a far more modest scale of increase than were those of Malthus. Also he does not discuss the possible solutions of this problem,

whether birth control, synthetic foods, or intensive agriculture—the limit for which may soon be reached

To summarise it may be said that Nature has not "played the game" with human life. Yet human ingenuity and human brains may penetrate far into Her secrets. There will be many readers to whom Professor Raymond Pearl's wonderful book will appeal: philosophers, mathematicians, the medical man (of course), the public health worker, the biologist, and, for clarity and charm of exposition upon a subject of predominant interest, the layman also. Here is in embryo a philosophy built upon sure foundations and with a message which all who run may read.

R. KNOWLES

Current Topics.

Research work in Diabetes

Dr Jyoti Prokash Bose, Dr Mitra Research Scholar at the Calcutta School of Tropical Medicine, who has been trained at St Bartholomew's Hospital by Dr Mackenzie Wallis, has now opened the Diabetes Research Enquiry at the Calcutta School of Tropical Medicine. Dr Bose is experiencing some difficulty in getting into touch with clinical material, and solicits the hospitality of our columns in order to beg that practitioners in the neighbourhood will send cases for study and investigation. All examination of blood and urines, etc., will be carried out free of charge, and beds reserved for suitable cases in the Carmichael Hospital for Tropical Diseases. The placing of a whole-time research worker on the diabetes problem in India may do much to improve methods of diagnosis and treatment, as also to elucidate the causes of the frequency of the disease among Bengalis, and we trust that the profession in Bengal will come forward to assist in the enquiry.

The Widal Reaction in cases of Enteric fever in inoculated persons

At a meeting of the Medical Section of the Asiatic Society of Bengal on the 14th March, 1923, Capt. G Shanks, M.D., I.M.S., Professor of Pathology, Calcutta Medical College, read a paper on "Agglutination Results in Enteric Fevers occurring in Inoculated Persons."

He first dealt with the history of the Widal reaction as a diagnostic procedure. Gruber and Durham in 1896 first seriously studied the clumping of bacteria by a homologous immune serum, and shortly afterwards Grunbaum and Widal applied this reaction in the reverse direction to the diagnosis of typhoid fever. The universal use of the Widal reaction soon followed. Later, with the introduction of *B. typhosus* vaccine and with the still later use of T A B vaccines, diagnosis by this method became more complicated, owing to agglutination reactions due to the protective inoculation.

Thanks, however, largely to the enormous improvements in its technique introduced by Dreyer and his co-workers, the test has now again become standardised and reliable, and is to-day probably the most valuable laboratory test for the enteric fevers.

The agglutination power generated in a given serum is not permanent, nor can all species of bacteria promote it in an equal degree. The organisms of the enteric fevers, however, are particularly strong agglutinogens. Agglutination is an immunity phenomenon quite distinct from bacteriolysis, and may occur when bacteriolysis is not possible, and with de complemented sera. Agglutinated bacteria may still be viable and be made to grow again on culture.

The presence of electrolytes such as NaCl is essential for agglutination and Michaelis has shown that varying pH concentrations give rise to the clumping of different bacterial species. Hirsch concludes that bacteria in normal saline behave chemically and electrically like the anions of the salt of a strong base and a weak acid. When agglutination occurs by homologous serum the medium in which the reaction occurs increases in alkalinity.

The main factors influencing the reaction are —

- (a) Temperature,—the optimum being 55 degrees C.
- (b) Nature of the bacterial emulsion, whether living or killed and if killed, whether by chemical or physical agencies.
- (c) Gentle motion, which favours the reaction.
- (d) Time, the optimum period being two hours at 55 degrees C for the enteric group, and four hours at 55 degrees C for the dysentery bacilli.

After reviewing the different macro-and microscopic methods of carrying out the test, Capt. Shanks dwelt upon the extreme value of Dreyer's technique, which, when once mastered, is as rapid as any other and infinitely more reliable. Here fixed proportions of diluted serum and emulsions are used. The emulsions are grown on veal broth of uniform reaction, killed by the addition of 0.1 per cent. formaldehyde and diluted to a standard concentration by opacity. Finally, as not only does the agglutinability of various strains of a given organism differ, but also the agglutinability of the same strain under different conditions, Dreyer introduces a factor whereby the titre obtained with one such emulsion may be reduced to conform with that obtained with another. This factor divided into the titre gives the number of agglutination units. Tubes of uniform size and thickness should be used, and the reaction carried out on the water-bath at 55 degrees C. The drop method is used and a standard dropping pipette employed, the error of which is only about 3 per cent. The method requires a fair amount of serum but it is in reality easier to bleed a patient from a vein than from a finger.

In enteric fevers the agglutinins usually appear about the 5th day and ordinarily increase to a maximum about the 16th to 24th day of disease after which they diminish at first somewhat rapidly, and then more slowly over succeeding months. They may finally disappear altogether.

During 1915, Capt. Shanks was working in a hospital in France to which Professor Dreyer was attached, and to which most enteric cases were admitted. Observations were carried out by the Dreyer technique at intervals of every few days upon these cases and he wished to illustrate the results obtained in persons suffering from enteric fever after previous protection by vaccines.

Group A—Typhoid fever in persons inoculated against *B. typhosus* only

Case 1—The maximum titre was at first low, was 1 in 140 on the 15th day, 1 in 200 on the 28th day and subsequently fell off slowly.

Case 2—Low agglutination at first, 1 in 150 on the 12th day, 1 in 850 on the 16th day. Thereafter a relapse with a high titre of 1 in 6,400 on the 24th day, followed by a fairly sharp fall to 1 in 3,500 on the 36th day.

Case 3—A similar one to Case 2. Titre 1 in 200 on the 20th day, then a relapse with titre 1 in 4,000 on the 28th day, and 1 in 14,000 on the 31st day.

All three cases showed delayed but very high titres ultimately. None showed any co-agglutinins to Para A or B.

Group B—Para B infections in persons inoculated against *B. typhosus* only

Case 4—The maximal titres reached were 1 in 1,500 for Para B on the 16th day, and 1 in 650 for typhosus on the same day. Both curves showed a sudden rise and less sudden fall.

Case 5—The Para B curve shewed very high titres 1 in 32,000 on the 14th day, 1 in 40,000 on the 22nd day and a drop to 1 in 5,000 on the 48th day. The T curve began at 1 in 18,000 on the 14th day and dropped through two intervening readings to 1 in 1,500 on the 48th day.

Case 6—The Para B curve rose steeply to 1 in 8,100 on the 28th day from a first reading of zero, and dropped to 1 in 2,500 on the 39th day. The T curve remained below 1 in 300 throughout.

Case 7—A similar set of readings the Para B curve rose sharply to 1 in 1,750 on the 23rd day, then fell to 800 on the 33rd day. The T curve rose from 1 in 200 to 1 in 350 and then declined slowly to 1 in 150. None of the four cases shewed co agglutinins to Para A.

Group C—Para A infections in persons inoculated against B typhosus only

Case 8—A long drawn out case with febrile exacerbations. The Para A curve rose from 1 in 60 on the 49th day to 1 in 350 on the 53rd day, dropped to 1 in 40 on the 86th day and was 1 in 150 on the 92nd day. The T curve was almost parallel but at a lower level maximal titre 1 in 250 on the 53rd day.

Case 9—A similar one to *Case 8*. The Para A curve remained low at first, being only 1 in 50 on the 32nd day, then shot up to 1 in 1,420 on the 43rd day, and dropped to 1 in 725 on the 55th day. The T curve started at 1 in 400, reached 1 in 700 on the 32nd day, then dropped to 1 in 200 on the 55th day.

Case 10—Shewed a Para B maximal titre of 1 in 5,000 on the 12th day, dropping rapidly to 1 in 850 on the 47th and subsequent days. No agglutination to B typhosus.

Case 9 shewed agglutination to Para B at 1 in 25 only on the 43rd day, but at no higher titre. *Cases 8* and *10* shewed no co-agglutinins to Para A.

Group D—Para B infection in a patient previously inoculated with triple T A B vaccine

Case 11—The Para B curve rose from 1 in 1,000 on the 11th day to 1 in 1,600 on the 14th day, then fell to 1 in 150 on the 29th day. The T and Para A curves remained almost constant at levels below 1 in 350 and 1 in 150 respectively.

Group E—Controls. Non-Enteric fever cases in persons inoculated against B typhosus only

Here the T A B curves in cases of acute articular rheumatism, appendicitis, gastro-enteritis, tubercular peritonitis and in three cases of trench-fever were shewn. No agglutinins were found to Para A, and B, and the T curves were all at a low level and shewed no marked variation at different dates of disease, the biggest recorded variation being from a titre of 1 in 90 to 1 in 120 in the first patient.

The results shew the regularity of the curves in uncomplicated enteric cases, the sympathetic rise to B typhosus when a paratyphoid infection is present, and the absence of agglutination changes in fevers other than enteric. All eleven cases were diagnosed as enteric by the recovery of the specific bacillus from cultures of the blood or faeces or urine.

In spite of criticisms by Ledingham, Garrow, and others the speaker maintained that Dreyer's contention was right and it was further supported by the evidence of Perry at No. 14 Stationary Hospital and by that of Glynn and Tapley. Even Sir William Leishman, who was naturally loth to admit that mild and atypical cases of enteric might occur in spite of the triple inoculation, concludes that such cases do occur, and that a series of tests carried out during the fever by experienced workers is capable of furnishing clear indications as to the particular organism concerned, even in a large majority of the cases from which a bacillus cannot be cultivated.

In conclusion Capt. Shanks agreed with Capt. Perry that provided the Dreyer technique be used and that the tests be carried out by an experienced worker, a change of from 100 to 200 per cent in titre, manifesting

itself as a regular curve, and reaching its maximum between the 16th and 24th day of disease, justifies a diagnosis of acute enteric infection due to the specific organism concerned. In many cases, whilst the rise in titre against one particular organism is so pronounced that a specific diagnosis can be made, yet, in a certain number, the rise of titre against all is so similar that only a diagnosis of enteric group fever can be given.

The Selection of a Disinfectant.

At a meeting of the Medical Section of the Asiatic Society of Bengal on the 14th March, 1923, Major A. D. Stewart, D.F.H., I.M.S., Director of the Public Health Laboratories, Bengal, read a paper on "The Selection of a Disinfectant."

Major Stewart claimed that the views of both general medical practitioners and even of public health officers upon disinfectants were to-day delightfully vague and, at the same time, narrow. No one ideal disinfectant, in Ehrlich's sense of a complete sterilizer, exists to-day. The proper application of disinfectants by a health officer is a test of his training and knowledge, combined with his business ability to see that he is not using an expensive article for a simple purpose, or a cheap and inefficient substitute in cases of real necessity.

Changes of fashion applied to disinfectants no less than to surgery and medicine in general. Sulphur dioxide was once the fashion, to-day formalin, izal or cylin were in vogue. Sulphur dioxide was found to be an excellent disinfectant in yellow-fever first, then it was shewn to have low bactericidal powers and fell into disrepute, later the *Stegomyia* transmission of yellow-fever was discovered and still later the value of sulphur dioxide as an insecticide. Both laboratory tests and clinical experience were essential in the choice of a disinfectant. There was no point in a health officer demanding an agent which would kill anthrax spores in half an hour, when he requires only to kill the germs of the enteric fevers. Where only a deodorant is required, a bactericide with high germicidal powers may not only be unnecessary but may even be inefficient for the purpose for which it is used. Much waste of public money occurred through health officers not realising these essential but elementary facts.

The ideal disinfectant should conform to the following essentials—

- (1) It must possess a high germicidal power.
- (2) It must not be rendered inefficient in the presence of organic matter.
- (3) It must be reasonably stable and not deteriorate under ordinary conditions.
- (4) It must be soluble in or easily miscible with water.
- (5) If it forms only an emulsion with water, this emulsion should be permanent.
- (6) It should be non-toxic to man.
- (7) It should have powers of penetration.
- (8) It should neither corrode metals, nor bleach or rot cloth.
- (9) It should be reasonable in price.

But, since such an ideal disinfectant is, to-day, not known it remains to make discretionary use of such as are known. To-day medical men tended rather to the use of heavy artillery in disinfection and excessive strength of disinfectants, whereas well directed rifle fire might be better. A practitioner's duty was not merely to cure infectious diseases but to prevent their spread and disinfection should begin at the patient's bedside,—a point only too often overlooked. Three points come up for consideration—(a) What are we disinfecting? (b) Where the disinfecting agent is to be applied, and (c) When to disinfect.

How disinfectants kill bacteria is still not fully understood. Electrolytically dissociated ions seem to act more vigorously than do non-dissociated ones and thus

is especially true of the metallic salts. Disinfectants may kill bacteria—(a) By oxidation of their protoplasm, as in the case of chlorine, bleaching powder and the permanganates (b) By coagulating their protoplasm, as in the case of phenol and its derivatives (c) By ionic coagulation, as with the metallic salts and, finally, (d) by emulsoid action and adsorption. Generally speaking emulsions have a higher germicidal action than have solutions, especially in connection with the phenol derivatives. There is an actual bombardment, as visible under the microscope, of bacteria when they are brought into contact with such disinfectants, and an actual concentration around each bacterium of disinfectant stronger than is the case with ordinary solutions. This results in ionic adsorption on to the surface of the bacterium. But the presence of organic matter will affect this result, and the phenol bodies in an emulsion containing organic matter have their potency reduced to one-half or one-third of the original.

The presence of electrolytes may lower the value of a disinfectant. Substances which act by oxidation, such as the chlorine derivatives, are rapidly used up. Metallic salts, acting by coagulation, do not penetrate readily. Probably carbolic acid in solution and formalin are less interfered with by the presence of organic matter than any other disinfectants.

The question of time is too often forgotten in the application of disinfectants. Thus mercuric chloride has a phenol coefficient of 135 when acting for 2½ minutes but one of 550 when acting for 30 minutes. The time factor especially applies to metallic salts and bleaching powder derivatives. There is a logarithmic ratio between concentration of the disinfectant and the time taken to disinfect.

Temperature is a second important factor. Disinfection takes place more quickly at high temperatures than at low ones. As the temperature increases arithmetically the velocity of disinfection increases geometrically. The germicidal value of phenol increases 7 to 8-fold for every 10 degrees C rise of temperature, and warm solutions should always be used.

Reaction of the medium is also important. Thus if lime be used in an acid environment, sufficient must first be added to neutralise the acidity and then excess to cause disinfection.

Turning to the choice of disinfectants in actual practice the first point to note is the purpose for which the disinfectant is wanted. Disinfectants are selective. Thus glycerine whilst a good germicide for ordinary purposes is inactive against the virus of small-pox, carbolic acid is also inefficient for small-pox, and emulsions are not efficient disinfectants for faeces.

Turning to the different agencies in use—

1. The natural disinfecting agencies such as sunlight, dryness and cleanliness, including the removal of organic matter, the destruction of insects and vermin and their breeding places, should not be neglected. Dry heat at 150 degrees C is now used practically only in laboratories. Simple boiling is one of the best and readiest methods of destroying infections, especially if soap, alkali or boracic acid be added to the boiling water. In boiling cutting instruments 1 per cent. sodium carbonate should be added to prevent rusting. Steam under pressure in a modern steam disinfectator is suitable for bedding, clothes and mattresses but shrinks woollen goods and ruins leather, fur, skin and rubber articles. Elaborate apparatus is not necessary, the simple 'Serbian barrel' or the 'Knapsack disinfectator' being quite efficient.

II. *Formaldehyde*—Gaseous disinfectants only reach the surface of articles and do not penetrate. With this proviso, however, formaldehyde is the best gaseous disinfectant we have. It has a wide range of applicability, does not injure delicate fabrics, does not corrode or bleach, for instance an oil-painting can be disinfected by formalin vapour. It is not, however, an insecticide and is useless in anti-plague measures. In the meshes of cotton fabrics formaldehyde vapour becomes polymerized and is deposited as paraform, and

this prevents its further penetration. There are various formalin vapour lamps on the market, but one of the readiest ways of generating it is to mix 10 ozs of potassium permanganate with 20 ozs of commercial formalin per 2,000 cubic feet of room space. As a spray formalin is useful for wardrobes, drawers, etc.

III. *Sulphur dioxide* is an efficient insecticide but a poor germicide. The gas is heavy and the generator should be placed, not on the floor, but at some height above the floor of the room. *Hydrocyanic acid* is too dangerous for routine use. Its especial value appears to be the fact that it does not kill the embryo of grains, whilst it will effectively kill fleas, insects and rats.

IV. *Quicklime* is a most useful disinfectant. A 1-per cent watery solution kills non-spore bacteria in a few hours, a 3-per cent solution kills typhoid bacilli in an hour, and a 20-per cent solution added to an equal part of faeces disinfects in an hour. It can be used on nearly every occasion where disinfection is wanted, for purifying water, for disinfecting excreta, for floors, walls and stables especially. The quicklime used must be absolutely fresh, but as it is in common use all over India for building purposes, it is both cheap and handy. A good specimen should contain no calcium carbonate and should not effervesce on the addition of a dilute mineral acid.

In use, quicklime should first be slaked with water, and then four parts of water added and the whole well mixed to form fresh milk of lime. At least equal parts should be used for disinfecting faeces, and the whole mass mixed with a stick, covered, and allowed to stand for two hours. The perfunctory sprinkling of quicklime over stools is quite useless. An alternative is to add hot water to cover the stool, add a handful of fresh quicklime, stir thoroughly and allow to stand for two hours.

V. *Chlorine derivatives*. Bleaching powder is too familiar to need more than mention. Colonel Greig was the first to emphasise its value in disinfecting latrines in connection with cholera outbreaks. Its disadvantage is its instability, and hence the numerous attempts to produce hypochlorites in such a condition that they will be sufficiently stable to retain the available chlorine, and sufficiently unstable to give up nascent oxygen in the presence of organic matter. This is not a simple matter. "*Chlorogen*" is hypochlorite fixed in alkaline solution, and is quite a good product, but is often much weaker in available chlorine than is stated and consequently sometimes uncertain. *Chloros*, also a hypochlorite preparation fixed by alkali, was used by Houston for water purification, and he states that it should have from 12 to 14 per cent. of available chlorine. In India it is not sufficiently stable to be very useful and its use would necessitate almost daily estimation of the available chlorine content. In *Electrolytic chlorogen* Mr Hutchinson has wisely aimed at a low available chlorine content 2½ to 3 per cent, and at greater stability under Indian conditions. He produces a high concentration of sodium hypochlorite by electrolysis of brine, keeping the temperature uniformly low and so preventing the evolution of chlorine gas. The hypochlorite is fixed by lime. Samples kept in amber coloured bottles on the laboratory bench at room temperature for several months had retained their available chlorine content in a remarkable way, but when kept in colourless bottles a fair amount of the available chlorine had been lost. Experimentally Major Stewart had found it very efficacious in purifying water and in disinfecting sewage effluent. Messrs Mather & Platt had, however, informed him that the cost of the installation necessary for its large-scale production was some Rs 3,000 and this very high price would militate against its use. It has been very highly recommended for hospital and surgical use.

There have been many attempts to utilise the chlorine element in amine combination. One such product, *Chlorozone*, gave very good results as a germicide. The

Bengal climate, however, was too much for it and after a fortnight at bench temperature it refused to form a clear solution and its Rideal-Walker coefficient fell to little or nothing.

VI *Corrosive sublimate* is our most powerful and valuable germicide. It kills both bacteria and spores. In public health work, however, it has to be used with very great care. It corrodes metals, is very poisonous and forms insoluble compounds with albuminous matter. It is therefore not suitable for feces or sputa. Spraying of a 1 in 500 solution of it with HCl and glycerine is the official French method of disinfection.

VII *Coal-Tar disinfectants*. These are to-day much overrated and it is unfortunate that hygienists and even medical men to-day often regard disinfectants and coal-tar products as synonymous. Their true place is last on the list of disinfectants.

When coal-tar is distilled there comes off—(a) a light oil at temperatures up to 170 degrees C. This consists of hydrocarbons, pyridine, some phenol, benzol, toluene and xylene. (b) Between 170 degrees and 230 degrees C the middle or carbolic oil comes off. This consists of naphthalene and crude carbolic acid. (c) Between 230 degrees and 270 degrees C, the heavy or creasote oil comes off, and contains some carbolic acid, cresol, naphthalene and anthracene. (d) Most of the anthracene comes off above 270 degrees C, and (e) the residue is pitch.

What a coal-tar disinfectant is depends entirely upon the manufacturer. It should be noted that these antiseptics act more powerfully in emulsion than in solution. Many of the coal-tar disinfectants on the market are remnants for which there is no industrial or commercial use, emulsified with various agents and sold as the best disinfectant for household and domestic use. Such disinfectants consist of—(a) hydrocarbons and inert oils and bases. (b) phenols and phenol-like bodies, cresols and similar products, and (c) emulsifying agents such as soaps, resins, albuminoid bodies and water. The germicidal agents in such products are the phenols, the cresols and their higher homologues, the hydrocarbons and inert oils having but little germicidal value but being to a certain extent deodorants and insecticides. The percentage of phenol bodies present therefore determines their germicidal value. A careful and conscientious manufacturer, aiming at giving an emulsified disinfectant of high germicidal value, would exclude the inert hydrocarbons and bases, and would select a fraction containing a large percentage of phenols and cresols. An unscrupulous manufacturer will take almost any coal-tar distillation residue and emulsify it. *Izal* is an example of a coal-tar disinfectant which it is claimed consists only of the higher monobasic phenols with no inert oils or lower toxic phenols. The higher phenols, however, do not oxidize organic matter and are therefore not very efficient as deodorants and insecticides. The coal-tar disinfectants are often, in reality, used as deodorants simply, and for this purpose high grade and expensive germicides are not necessary. As deodorants the lower oils and cresols should be sufficient and should be less expensive also.

Soaps and resins are usually employed to emulsify these disinfectants and are easily affected by such electrolytes as NaCl, calcium salts and organic matter. With some of these preparations, whereas a good emulsion is formed with water there is little or no emulsification with saline or in urine, and such disinfectants are quite unsuitable for urinals or for use on board ship. Urine normally contains 1 per cent of NaCl, and in febrile conditions may contain more, and any coal-tar disinfectant for general use should emulsify in a 2 per cent NaCl solution to be effective. The black deposit which one so often sees in water-closets after use of these disinfectants simply means that they do not emulsify. *Izal* and *Cyllin* are examples of coal-tar products which do emulsify well in saline solution.

Having passed such preliminary tests the second test for such products is their Rideal-Walker coefficient, using distilled water as diluent and a standard emulsion of *B. typhosus* for the test. The value of pure phenol being taken as unity. Chick, however, recommends a feces emulsion for the test and the American Hygienic Institute sea water in preparing the test solution as diluent. The Rideal-Walker coefficient is of value when results are read by the same worker working under similar conditions. Major Stewart's tests for a disinfectant in brief may be summarised as—

(1) Physical examination in distilled water, 2 per cent saline, hard water, urine and starch decoction. If the disinfectant does not emulsify well under these conditions it may be discarded.

(2) If it passes the preliminary tests, the Rideal-Walker test is applied and no disinfectant passed as a germicide which does not give a coefficient of 10 or more.

(3) The bromine absorption test is then useful, since the higher phenols and cresols have a lower bromine absorbing power than the other oils and thus may give a rough indication of their relative proportions.

(4) Finally the maker's instructions and the price of the article if used wholesale, must be considered.

In general terms under different conditions, one may wish to use a germicide only a spore killer, an insecticide, a penetrating disinfectant, a superficial disinfectant only or merely a deodorant and cleanser. Attention to such points may make for efficiency and save much waste of public money. In deodorising a urinal for instance it is not necessary to use a germicide of high price which is guaranteed to kill anthrax spores.

At the conclusion of Major Stewart's most interesting paper which we give in full detail as we feel certain that it will interest our readers, Dr. Brahmachari mentioned that formaldehyde-sodium disulphide might be a disinfectant worthy of study. In contact with alkalis it liberates formaldehyde and has been administered by intravenous injection in plague. Lt-Col J. W. D. Megaw, M.S., as President of the Section conveyed the thanks of the meeting to Major Stewart for an admirable and authoritative exposition of a subject of importance to every medical man in the country.

Malingering in the Indian Army

CAPT A. P. PILLAY, OBE, V.B., B.S., who was in charge of the Indian Details Camp at Deolali from 1918 to 1919 summarises his experiences on this subject, one of perennial importance to military medical officers. As venereal disease cases were always evacuated to their depots these were most often simulated. Twenty cases of acute urethritis were once examined and only five showed the gonococcus. Crushed garlic, juice of the "milk hedge" (one of the *Euphorbiaceæ*), and marking nuts were the local irritants usually employed. Local blisters on the penis or even an acute urethritis may be produced. The discharge from intra-urethral ulcers at first consists of blood rather than pus—a useful point in diagnosis. In one case a sepoit deliberately induced gonorrhoea in himself by inoculating himself with the fresh gonorrhoeal pus from an acute case. In most cases of simulated gonorrhoeal urethritis irrigation for a few days with any antiseptic lotion will cure the condition.

A subcutaneous injection of jequirity may give rise to extensive sloughing and bits of the seed inserted under the skin by the aid of needles or pins may cause ulcers the size of an eight-anna bit. Otorrhoea is simulated by putting paste of *atta* into the ear, and by the other irritants previously mentioned. Extracts of castor-oil seeds and of jequirity can cause conjunctivitis, and even corneal ulcers and oedema of the lids. The irritant cause may sometimes be discovered by a thorough examination of the eye. Saffron may be used to produce an artificial jaundice of the conjunctivæ. Tobacco rubbed dark into the gums may produce a condition analogous to that of scurvy, whilst betel-nut,

half-boiled rice, or soap with opium when swallowed may give rise to diarrhoea

Apparent hæmatemesis may in reality be due to bleeding from the gums, whilst one ingenious patient with blood constantly present in the stools had made arrangements with a friend to supply him daily with fresh goat's blood. The oral temperature, as recorded on the thermometer, can be raised by chewing chillies, or by gargling with hot water. In brief, malingering in the army is a condition for which medical officers should be constantly on the look out. (*Abstract from original communication*)

Complement from Frog's Blood.

DRS LAL MOHAN GHOSHAI AND CHARUBRATA RAY, Demonstrators in Physiology, Medical College, Calcutta, advocate the employment of complement from frog's blood for the Wassermann reaction. Owing to an epidemic of disease among the laboratory guinea-pigs they tried serum from the common frog, *Bufo vulgaris*. Two to three c.c. of blood can be obtained from an ordinary sized frog, and if the blood of three or four frogs be pooled, sufficient serum is obtained for from eight to ten Wassermann tests. The blood is collected either by puncture of the sinus venosus in the pithed frog with a 5 c.c. hypodermic syringe, or by snipping it and collecting the blood in a test-tube.

The frog is less rich in complement than is the guinea-pig. In putting up the Wassermann reaction one has to use a 1 in 6 dilution in place of the usual 1 in 10 of guinea-pig serum, the amboceptor being two units and a 5 per cent. corpuscular suspension. In over a hundred tests frog complement was found to be an excellent substitute for guinea-pig complement, although end-results were less clearly marked. (*Abstract from original communication*)

The Etiology of Blackwater Fever.

ASSISTANT-SURGEON AGHORENATH GHORE, in charge of the Head-quarter hospital, Dinajpur certainly has the courage of his convictions since he believes that blackwater fever is essentially of malarial origin, and treats cases of this disease by intravenous injections of quinine. On the 5th November, 1922, he was called to see the head compounder of the hospital, who was suffering from blackwater fever, a man aged 32 and a "malarial saturate," whom he found semi-comatose, with a feeble, compressible pulse and with bleeding from the ears, mouth and nose. There was total suppression of urine, and a rigor was present, with an axillary temperature of 105 degrees F.

Twelve grains of quinine bihydrochloride were immediately given intravenously, followed by divided doses of calomel and one oz. of saturated mag. sulph. solution orally. In the evening the condition was the same, and a further 15 grains of quinine were given intravenously. Next morning the general condition was better, but there was intense jaundice. The axillary temperature had fallen to 98 degrees F, but there was still almost complete suppression of urine, only a few drops of red, gummy urine being passed. Pilocarpine was now given subcutaneously and saline per rectum.

Until the 11th, six days after being first seen, the patient did not pass more than a dram of urine per twenty-four hours, although on an alkaline mixture and an ounce of saturated mag. sulph. solution orally each morning.

By degrees the acute condition cleared, to be followed by at first the passage of four to five pints of urine per day and later an uneventful recovery. From the fourth day onwards the patient was on an alkaline mixture, with bromides and calomel.

Dr Ghore notes that blackwater fever is fairly common in Dinajpur, especially during the cold weather months. The symptoms are those classical of the disease, and a history of chronic malaria almost

invariable. Aching pain in the loins and sometimes in the hepatic, splenic and hypogastric regions is often felt. With a return rigor on the second day hæmoglobinuria may reappear. Clinically, except for the hæmoglobinuria, the picture is that of bilious malarial fever. Anuria often precedes a fatal termination.

He reviews the theories held as to the causation of the condition and is strongly in favour of the malarial origin of the disease. A second case which occurred whilst he was writing his article was that of a girl of about 16, very anæmic and subject to repeated attacks of malaria. The hæmoglobinuria was associated with high fever and constant purging and vomiting. Intramuscular injections of quinine and strychnine appeared to cure the case. A third case was in an anæmic boy of about 16 with hæmic murmurs. Early quinine injections on alternate days caused temporary disappearance of the symptoms, but they recurred later. Finally three intramuscular injections, each of ten grains of quinine with strychnine were given and the hæmoglobinuria cleared up and the patient was well in two days.

He concludes that in blackwater fever unless the state of the patient's pulse contra-indicates it quinine should be given, preferably by intravenous injection. Seven and a half grains may be given at once, followed by a second similar dose in four to five hours if the temperature does not come down. In addition calcium chloride should be given intravenously, two grains intravenously per 24 hours, with rectal salines, and alkalies by the mouth. Active catharsis should be employed, and if the pulse tension be low intravenous saline. In the vomiting of the disease calomel in 1/8th grain repeated doses, and especially chloretone are often of great value. The diet should be fluid, and rectal feeding may be needed in cases associated with obstinate vomiting.

In some cases low fever, rising daily to 99 or 100 degrees F, may persist after all symptoms have disappeared. In such cases soamin and ferri arsenate injections prove useful, in addition to quinine orally. (*Abstract from original communication*)

Meningism in Lobar Pneumonia.

DR. C. KRISHNAMURTY, L.M.P., Ponduru, Vizagapatam, reports a case of lobar pneumonia with meningism as a complication. The patient was a policeman, aged 22, admitted on the 10th January, 1923, three days after he had taken part in a local row. On the 13th the temperature fell rapidly from 104 degrees F. the previous evening to 99 degrees F. in twenty-four hours, but that night the patient was very restless, irritable, and refused to take medicine. This condition continued until the 16th, when drowsiness and sleepiness supervened. Calomel in 5-grain doses *bis die*, with a mixture containing potassium iodide and urotropine were given, and a daily enema administered. An attempt was made at lumbar puncture, but withdrew no fluid. By the 21st the temperature had reached normal, and the patient made an uninterrupted recovery. Meningism is a not infrequent complication in lobar pneumonia, and one which calls for immediate treatment. (*Abstract from original communication*)

Lobar Pneumonia in India.

DR. B. G. VAN, M.B., B.S., Grant Medical College, Bombay, comments on the frequency of lobar pneumonia at the left base in Indian subjects. European and American text-books state that lobar pneumonia is commoner at the right than at the left base, and attribute this to the fact that the right bronchus appears to be the main continuation of the undivided trachea. During 1922 the cases of lobar pneumonia at the J. J. Hospital, Bombay, shewed the following incidence: 135 at the base of the left lung, 94 at the base of the right lung, 33 at the bases of both lungs, 3 at the right apex, and 2 at the left apex. Total 267 cases.

Some explanation must be sought for this departure from conditions in Europe, and Dr Vad attributes the unusual frequency of lobar pneumonia at the left base in India to the commonness of enlargement of the spleen in India as compared with Europe perisplenitis in India presumably being followed by extension to the left side of the diaphragm and base of the left lung, which is often in a state of impaired vitality in Indians.

Three cases typical of this condition are quoted. The first was that of a patient with benign tertian malaria followed on the fifth day after admission to hospital by lobar pneumonia of the left base. The bed next to the patient was occupied by a pneumonia case. The second case was admitted with a temperature of 105 degrees F, intense dyspnoea, and an enlarged spleen. The base of the left lung was consolidated. In a third similar case benign tertian parasites were found in blood films. In all three intramuscular injections of quinine gave decided improvement.

He concludes that blood examination in even apparently straightforward cases of lobar pneumonia in the tropics is of importance. Malaria may often be discovered, either as a complication or as the primary infection, and the importance of recognising and treating such a complication cannot be over emphasised. In the second of the above cases an intramuscular injection of quinine brought the temperature down from 105.2 degrees F to 98 degrees, followed next day by a rise to only 101.5 degrees F. In the third case intramuscular quinine lowered the temperature from 104.8 degrees to 101.2 degrees and gave a subsequent low range of temperatures until the crisis on the evening of the 7th day.

Of the 135 cases of lobar pneumonia at the left base 84 had definitely enlarged and hard spleens, and 29 others, who had no splenic enlargement, shewed malarial parasites in the blood. The moral is to examine the blood for malaria in all cases of pneumonia the pneumonia may only be a sequel to a malarial infection, and cinchona therapy may be indicated. (Abstract from original communication)

Helminthic Survey of a Gurkha Battalion

CAPT R. C. WATTS, MD (L'pool), DPH, DTM, reports the results of a helminthic survey of a battalion of the Gurkha Rifles from the Brigade Laboratory, Abbottabad. Direct examination of the faeces was employed and concentration methods not used. Of 561 soldiers examined 139 were found to be infected. 85 per cent. with *Necator*, 12.2 per cent. with *Ascaris*, and 4.6 per cent. with *Trichuris*. Recruits taken by themselves shewed a 20-per cent infection with *Necator* but clearly good sanitary conditions and residence in the military lines lowered this degree of infection. Of these 139 infected soldiers 81 per cent. shewed no clinical manifestations of disease, 17 per cent. shewed other diseases masking the effects of helminthiasis, and only 2 per cent. shewed marked anaemia. Treatment was by the administration of 60 grain doses of thymol. It was found that on an average three such doses were required to clear the infection, and that all the worms removed were of *Necator* and not of *Ankylostoma* genus. (Abstract from original communication)

A Case of Imperforate Anus

DR JAGAN NATH CHOPRA, M.B., B.S., State Hospital, Srinagar, Kashmir, reports a case of imperforate anus in a male child nine days old. The abdomen was distended and tense, obstructive symptoms were supervening, and faecal matter was passing through the urinary passages. The child had refused the breast for eight days, and the condition was serious. There was no anal orifice, its place being taken by an elevated pigmented mass of skin, some quarter of an inch in diameter. The child's mother attributed the condition to her having during the solar eclipse filled up the mouth of a rat run with mud (!).

Under chloroform anaesthesia an incision was made from the middle of the perineum to the tip of the coccyx and deepened until the rectum was found. It opened into the bladder. The rectum was clamped and divided and its proximal end brought down to and sewn into the line of the incision. The severed end communicating with the bladder was next sutured, and the skin incision finally closed. There was not much bleeding as the incision and dissection were kept strictly to the middle line. On the tenth day the superficial sutures were removed, and later dilatation of the rectum practised with bougies. The child was last seen when four months old, when it appeared healthy and well. (Abstract from original communication)

Aortitis, with Special Reference to Syphilitic Aortitis

By S B BOYD CAMPBELL, M.C., M.D., F.R.C.P.,

Assistant-Physician, Royal Victoria Hospital, Belfast, Edin Med Jl, September 1922

SYPHILITIC aortitis is so common a disease in India that it is interesting to read this account of a series of cases which were closely observed in the United Kingdom. Evidently the disease is much more common in Europe than one would imagine from a perusal of the standard text-books, for we find that of all the cases of aortitis seen by Dr Campbell no less than 31 were syphilitic. The age incidence appears to be higher than in India, there were only six cases in persons under 40 years of age, 16 were between 40 and 50, and 9 were over 50.

The interval between the original infection by syphilis and the onset of symptoms appears to be longer than is the case in India, the average being well over 20 years.

Dr Campbell rightly emphasises the necessity for early diagnosis for in most cases the disease is recognised too late. The symptoms specially noted were as follows—

In most cases the history was one of dyspnoea, fatigue, and severe constriction or pain in the upper part of the sternum, in some cases there was pain in the region of the left nipple with palpitation. The majority of cases looked ill and had a peculiar fallow appearance. Pain varies from the merest twinge to the severe, alarming condition associated with angina pectoris. The usual site is under the sternum, often at the junction of the manubrium and body of the sternum. The frequency of the attacks varies, some cases go for relatively long periods free from pain, others have much more frequent attacks which are brought on by any slight exertion, excitement, or even by some small error in diet. A characteristic feature is the presence of pain at night. Pain in the syphilitic form of aortitis is almost pathognomonic. Dyspnoea next to pain is probably the most prominent and most important symptom, it varies in its severity and character. The patient complains of shortness of breath on exertion or he may have a sudden acute attack of dyspnoea. In some cases there may be short dry cough, often worse at night. In other cases a large amount of sputum may be brought up. A misleading sign which may be caused by syphilis, is an increase in temperature, which may vary from a daily swing of a degree or so to temperatures of 102 degrees to 103 degrees F. Only one case in the present series gave a history of intermittent fever, which disappeared on treatment.

Usually the first change met with on auscultation is a peculiar quality of the second aortic sound, described by some as a clanging sound, by others as a *bruit de tabourka*. This should always make one suspect a specific aortitis, though it is sometimes found in cases of high blood pressure. This peculiar second sound may be accompanied by a diastolic bruit. As the dis-

ease advances one finds a definite double aortic bruit, the diastolic one especially being well marked

The Wassermann test gives great help in arriving at a diagnosis, unfortunately, however, a negative Wassermann does not exclude syphilis. A definite diagnosis of the extent, exact position and nature of the lesion can often not be made until an X-ray photograph of the heart and aorta is taken.

Potassium iodide should be given in doses of 10 to 15 or more grains three times a day. It should always be accompanied by mercury. Novarsenobillon was given in doses of 0.3 gram for two doses, then six doses of 0.45 gram at intervals of a week. In practically every case there was a marked improvement after this course of injections.

Mosquito Netting

By BREV LT-COL W P MACARTHUR, R.A.M.C.,
11 Royal Army Medical Corps, Jan 1923

A good deal of confusion exists on the subject of mosquito-netting and Colonel MacArthur's clear and lucid account will go far to standardise the subject. Inefficient mosquito-netting is the commonplace in India, and the author shews how counts should be made,—the statement that a given netting contains so many holes to the linear inch conveying no accurate information.

Mosquito wire gauze, ordinarily known as "Screen-cloth," should be standardised by both the gauge of wire used, as determined by the Imperial Standard Wire Gauge, and the number of holes to the linear inch. A table of mesh per inch, diameter, aperture, and percentage of daylight transmission given will be useful to all who have to deal with the erection of mosquito-proof houses. The author considers that screencloth of 14 mesh to the inch and 30 I S W G should exclude mosquitoes, or at least *Stegomyia*, from buildings. Tanks and water receptacles should however be screened with similar gauze of 18 mesh.

With regard to cotton mosquito-netting, it consists of warp and bobbin or woof. The mesh of such material cannot be accurately expressed in terms of holes to the linear inch, since the count along the warp may differ from that along the bobbin. With a low power hand lens it is easy to distinguish the threads of the warp, which are more intimately interwoven, from those of the bobbin, which have a looser appearance and can often be seen to run free for a distance roughly equivalent to the diameter of a hole. Counts should be made along both warp and bobbin. To do these a piece of the netting is laid over a ruled square inch on white paper with a hole coinciding with a corner of the square and the number of holes along edge and along the oblique line starting at the same corner and running diagonally across the square are counted. The corner hole from which both the edge and the oblique line start is counted twice being included in both counts. The mesh is the sum of both counts.

Further, since cotton varies in diameter, and gauge cannot be taken as a standard, the weight must be taken as standard, together with the ratio of the accepted factor of 840 yards to one lb. Thus "30's" cotton means that such thread goes 30 times 840 yards to the lb. A very common cotton for mosquito-nets is derived from using 40's cotton for the warp and 60's in the bobbin, i.e., 40/60 cotton.

The author describes experiments on adult *S. fasciata* with different grades of screencloth and mosquito-netting. He disagrees with the West African Yellow-Fever Commission's findings that a mesh of "18 X 18 to the inch" is necessary to exclude this insect,—a mesh which would mean a count of about 40 according to trade measurements. In fact netting of 40/60's cotton with a mesh of from 18 to 24 holes to the square inch was ordered as presumably efficient in a large American contract.

Colonel MacArthur's article is admittedly preliminary in character, but he rightly lays emphasis on the

great necessity for experimental investigation of what netting is or is not efficient. "We are not concerned with what mesh a mosquito imprisoned in a test-tube may struggle through in order to escape from captivity, but with the mesh that a free mosquito will pass under natural conditions to obtain food. In order to attribute any importance to the presence of mosquitoes inside a net it would be necessary for the observer to have seen them himself actually coming through the mesh." Careful and properly controlled experiments are called for.

The Anæsthetization of Patients for the classical Cæsarean Section

By H R SPENCER, M.D., B.S., F.R.C.P.

Proceedings, Royal Society of Medicine, January 1923
 Section Anæsthetics

DR SPENCER raises the question as to what is the best method of anæsthetization for classical Cæsarean section. He considers inhalation anæsthesia better and more humane than spinal analgesia or local infiltration methods. Ether, he claims, has the great drawback that it leads to asphyxia of the infant, whereas chloroform does not. His own technique, based upon many years of experience is as follows—"No preliminary hypodermic injection is given. The patient, prepared for operation, is placed in the recumbent posture on the operating table in the theatre and the anæsthetic is administered there. Operator and assistants are prepared and the towels adjusted. Chloroform is then administered by the anæsthetist, who informs the operator when the patient is ready. The operation is then rapidly performed and the child, usually delivered within 30 to 40 seconds from the commencement of the incision, always breathes and cries at once. Ether is then administered for the rest of the operation, usually by the open method. If there is an unusual loss of blood a hypodermic of pituitrin is given."

The author appealed to the Section for a discussion on the subject, which is one of great importance, but the discussion which followed shewed that there was no unanimity of opinion.

An Unusual Type of Nodular Leprosy.

IN the *Annals of Tropical Medicine and Parasitology* for December 30th, 1922, Dr R G Archibald, D.S.O., M.D., records a case of an unusual type of nodular leprosy met with in the Sudan. The patient was an Egyptian, about 30 years of age. There was no history of syphilis, although his wife had had an abortion a few months previously. The duration of the disease was only a year. It commenced as an eruption which commenced on the face as small, shotty papules, similar ones next appearing on the forehead, ears, trunk, upper and lower extremities. The eruption caused little or no inconvenience. It was of a milky character the majority of the papules being discrete, with a smooth surface, circular contour, pink colour and shotty consistency. Many shewed a central depression or umbilication. The widespread distribution within a year, the discrete character of the papules and their curious umbilication raised a suspicion at first of either syphilis, vaccinia, yaws, or other conditions. Two of the shotty nodules from the arm were excised and found to be full of clumps of lepra bacilli. The case raises the question as to whether it might not have been one of secondary infection of the roseola of a syphilitic rash with lepra bacilli.

"Ice-Cream" (?)

WE have recently drawn attention to the composition of "milk" in the Presidency cities of India. A most interesting table on page 42 of the Annual Report for 1921 of the Health Officer of Calcutta, which

has recently come to hand suggests that ice-cream is even worse. Thus a sample from one of the hotels in Calcutta gave the following interesting analysis —

Total bacterial colony count	270,000 (presumably per c.c.)
B. coli count	100,000
Starch present.	
Fat	15 per cent

The low percentage of fat and the excessively high *B. coli* count suggest that this sample consisted of one part of genuine milk diluted with about two parts of faecally polluted water. The other seven samples analysed shew slightly better results. Human nature and the Calcutta hot weather being what they are, however, we suppose that people will still continue to consume this "delicacy."

The Progress of Surgery and the Rise and Fall of Surgical Operations

By JAMES BERRY, F.R.C.S.,

Proceedings Royal Society of Medicine, Jan 1923, Section Surgery

MR JAMES BERRY's presidential address is one which all surgeons and all who teach medical students should read. It is full of good matter, and sparkles with epigram and wit. He reviews the days from the old pre-antiseptic times to the present and the changes in operative procedures in many conditions. That surgical fashions change cannot be denied. Thus perineal lithotomy was once the favourite operation in England for vesical calculus, whereas suprapubic lithotomy has now almost entirely replaced it. Lumbar colotomy has given way to inguinal colotomy, and to-day caecostomy tends to replace colotomy.

When to operate is often a more difficult matter to decide than is *how* to operate. "I can teach my assistants *how* to operate in six months, but to teach them *when* to operate takes twenty or thirty years," is a recent saying attributed to an eminent French surgeon. The student who sees the modern surgeon at work is perhaps too apt to imagine that after all operative surgery is a very easy matter. Rigid asepsis and a knowledge of anatomy do not comprise surgery; there are many other elements which go to the making of a good surgeon. "A cholecystectomy that in a particular case may be quite the right operation for a Moynihan or a Mayo may be quite the wrong operation for Mr. A or Mr. B to perform, as he may find to his cost and to that of his patient." A slight error in the placing of a suture, the careless application of a single ligature, the placing of a clamp in a wrong place carelessly—in a word—may easily lead to the death of a patient. An old story, but still a good one, tells of a young surgeon who assured the patient's friends that the serious and dangerous operation which he was about to perform would be entirely successful. When pressed for his reasons he admitted that the mortality rate was 95 per cent. but added "I have already done this operation nineteen times and all the patients have died. This is the twentieth and he is bound to recover."

For a young surgeon there is possibly no better training than to serve as surgical registrar to a big hospital and to also carry out the surgical post-mortems. "Every young aspirant to a hospital staff should soak for several years in pathological museums, in operating theatres and in post-mortem rooms. He can scarcely have too much of any of the three. He must learn his anatomy and surgical pathology thoroughly, he must watch unnumberable operations and see hundreds and thousands of clinical cases before he is really fit to practise first-class general surgery. He must expect to have a hard time

in his earlier days, and he will probably find it difficult to make a living. He ought not to expect to do much surgical practice of a remunerative kind until he has had twenty or thirty years of steady hard work at learning the elements of his profession. I know well that it is a dog's life, but for all that he is a happy dog who leads it."

Brilliant as are the results to-day in operations where strict asepsis is possible and essential, Mr. Berry is not so satisfied with the present-day results in operations undertaken where sepsis has already been established, especially in acute suppurative conditions of the abdomen. A surgeon cannot arrange for his patients an afternoon on which he will operate upon, say, a fulminating appendicitis or a perforated gastric ulcer, and knowledge of how to face such emergencies can only be acquired by long years of hospital experience.

Appendicectomy is perhaps an operation which is to-day performed too frequently. Most harm is done when the case is not seen in the very early stage of the disease, and especially when the stage of abdominal distension has already been reached. After all *most* of such cases do not die if left alone, and the delay of a few days may put the patient into a much more favourable condition for operation if it has to be undertaken. But it is difficult to dogmatise on the subject of appendicitis and each case must be considered upon its own merits. In acute suppuration in the abdomen there was in the 'nineties' a tendency to do far too much and free incisions and irrigation of the abdomen gave a tremendously high mortality rate among such cases. It is often better in such cases to interfere as little as possible at most putting in a drainage pipe. "Think before you decide to operate, what is likely to be the natural course of the disease if not operated upon and what possible harm your operation itself may do." It is commonly believed that the modern custom of operating freely for acute appendicitis has resulted in a great saving of life, but is this really the case? The statistics of the Registrar-General appear to shew that the mortality from appendicitis has not diminished since the custom of operating for acute appendicitis has become so widely prevalent. The surgery of the war was very brilliant and led to marvellous results. Yet in one respect its influence may have been detrimental at the present time large and dangerous operations are being undertaken by those whose qualifications for undertaking them consist chiefly in a few years of practice in military surgery, the surgery of injuries inflicted upon young and previously healthy men. Great experience of war surgery does not necessarily qualify a man for operative work in diseases of the bladder, the stomach, the biliary passages and the like.

Mr. Berry is strongly of opinion that the would-be specialist should stick to his own rôle. He quotes instances of gynaecologists operating upon the appendix and even upon the gall-bladder, of laryngologists undertaking deep dissections of the roof of the neck, a region with which they are not necessarily familiar. On the other hand the general surgeon tends to stray into fields better left to the specialist. A good story told is that of an elderly gynaecologist whose previous training had been solely that of a physician and whom Mr. Berry found sweating profusely in the operating theatre, wrestling with a retroperitoneal mass, which he was trying to remove. Having been told that the so-called tumour was a solitary horseshoe kidney lying over the promontory of the sacrum, he realised his mistake and tied off the vessels which had already been cut and closed the abdomen. At the post-mortem next day it was found that both renal arteries and ureters had unfortunately been tied before the mistake was discovered. It also transpired that the patient had originally come to the out-patient department with only some trivial complaint. Even worse than such fatalities may be the 'howlers' in diagnosis which may be made by men straying into fields with which they are

totally unfamiliar errors such as the one immortalised in the following doggerel —

"There was a young woman named Mopsy,
Who had an ovarian dropsy
When they plunged in a trocar,
A voice exclaimed 'Ma!'
They're hurting your own Popsy Wopsy!"

Mr Berry has even known a distended bladder opened by mistake for an ovarian cyst, with a fatal result.

Many answers might be given to the question "What constitutes a good surgeon?" Mr Berry's favourite answer is "One who knows when to put in and when to take out a drainage tube," a matter which cannot be learned from books, but only from experience. "No examinations," wrote Sir Frederick Treves, "can elicit what a surgeon can do. He must know the human body as a forester knows his wood. As an operator, moreover, he must be a deft handicraftsman and a master of touch. He may be a clever manipulator and yet be mentally clumsy. He may even be brilliant, but Heaven help the poor soul who has to be operated upon by a brilliant surgeon. Brillancy is out of place in surgery. It is pleasing in the juggler, but it causes anxiety in the operating theatre."

The surgeon's hands must be delicate but they must also be strong. He needs a lace-maker's fingers and a seaman's grip. He must have courage, be quick to think, and prompt to act, be sure of himself and captain of the venture he commands. I conceive of him not as a massive Hercules wrestling ponderously with Death for the body of Alcestis, but as a nimble man in doublet and hose who, over a prostrate form, fights Death with a rapier."

Prophylaxis of Malignant Growths of the Mouth, Face and Jaws

By JOSEPH RILUS EASTMAN, M.D.,
Indianapolis

Jour Amer Med Assn, Vol 79 1922

THIS paper discusses a very important subject, one which is of special interest in India where cancer of the mouth and jaws is very common. After mentioning the various theories of the causation of the disease Dr Eastman goes on to say—"If it were true that cancer is a constitutional disease, all of our efforts to lower the incidence of cancer of the mouth, jaws and face by the removal of jagged teeth, the cure of leukoplakia, or the interdiction of the pipe would be to little purpose, but every surgeon, out of his own experience, can recall at least several instances in which cancer has been ablated completely and permanently, for example, by the amputation of a hand or foot or removal of a lip."

It is well established that cancer of the lip, mouth and tongue practically always attacks men who abuse tobacco, have jagged teeth, and ignore the dentist. Lip cancer is six times more common in men than in women, lip cancer in women nearly always developing among pipe smokers.

Bloodgood, speaking of tongue cancer, says that there is always a warning sore spot, a white patch, or an area of irritation, and that examination and treatment at once protects from cancer.

Little concedes that smoking is almost a pre-requisite for the appearance of cancer of the lip. In India it is the plug of betel and its concomitant ingredients that takes the place of the pipe, and it is quite obvious that chronic irritation either of a mechanical or chemical nature is the most important factor in the causation of epithelioma in India.

Some Surgical Aspects of Filariasis Disease.

THE BRITISH JOURNAL OF SURGERY (Vol 10, No 38, 1922), contains a very able article by Lt-Col F Powell Connor, D.S.O., F.R.C.S., I.M.S., Calcutta, on this subject.

The following abstract with special reference to operative treatment, will be of interest to our readers.

Allusion is first made to the numerous surgical conditions which may be imitated by inflammation produced by the calcified remains of guinea-worms.

X-ray prints are given to illustrate cases where synovitis, sciatica, periostitis, etc. have been wrongly diagnosed.

With regard to *F. bancrofti*, the various surgical complications are mentioned, but cannot be gone into here in detail. Our ignorance of the exact pathology of these conditions is referred to. The original article must be read for suggestions in this direction.

The operation for removal of elephantoid enlargement of the scrotum and sheath of the penis, as performed by the author, is referred to under the following headings —

1 The incision varies with the size and variety of tumour, and is not very important except that the perineal flaps should be made as wide as the healthy tissues will allow of. In very large tumours it is wise to isolate and lay bare the penis and testicles before fashioning the perineal flaps. In the case of smaller tumours it is quicker to cut these flaps and expose the testicles from behind, and deal with the penile sheath last.

2 Much time is saved by tearing through the tissues with gloved fingers as soon as the soft layers are reached.

3 Blood-vessels, which are generally of considerable size should be tied with catgut after clamping, twisting is not a safe procedure. Ligatures will not slip if anchored to the tissues by a needle.

4 The testicles should be accommodated beneath the perineal flaps when these are sufficiently large to cover them. Failing this they can be placed more easily in pockets excavated by the gloved fingers in the subcutaneous tissues of the adjacent parts of Scarpa's triangle.

5 Drainage is not generally necessary.

6 It is important to fix the fibrous sheath of the penis at its base with catgut sutures to the adjacent skin edges, to prevent retraction. The author never utilizes the preputial mucous membrane, though often tempted to do so, to cover the distal portion of the raw surface of the penis. It is very liable to solid oedema. Skin-grafting can be done at once or after a week by Thiersch's method.

7 The efficient dressing of these cases is most important, and the method introduced by the late Colonel Stevens, I.M.S., is very suitable. It is by means of rolls of 1-inch lint soaked in 1 per cent picric lotion or normal saline. About four inches of the beginning and end of each roll are applied in turn to the surface of the belly, perineum, or inguinal region, while the central parts of the bandages are wound round the penis. These tails are then held down by an ordinary double spica bandage after the usual dressing of gauze and cotton-wool has been applied. The lint becomes sufficiently stiff on drying to keep the penis comfortably cased.

8 Every precaution must be taken to prevent any soiling of the wound by urine.

The only weak part of this operation is the Thiersch's skin-graft of the penis. No suitable flap or modification of the Indian operation (as for rhinoplasty) has yet been devised to replace it. Quite recently the author has tried a new device and has been astonished at the success obtained. This consists in cutting a sufficiently large flap from the thick oedematous tissue covering the region of the dorsum of the penis. This is pared down at the end of the operation with a razor and curved scissors till it is barely thicker than the normal skin of the penis. It is then used to cover up that organ completely. Contrary to expectation, this skin has become quite soft and pliable after a few days, and if this result is always obtained, this procedure will remove the only defect of the operation. It would seem that the skin and subcutaneous tissues of the

dorsum of the penis and of the pubes are quite capable of filtering their own lymph if not embarrassed by the lymph of the scrotum and neighbouring parts

The Tropical Diseases' Bulletin Sanitation Supplements

THE Tropical Diseases' Bulletin is too well-known to need any introduction to our readers, but we think it is not generally known amongst medical men in India that the Tropical Diseases Bureau publishes annually two special "Sanitation Supplements." These deal with matters of applied Hygiene in the Tropics and are under the able editorship of Lt-Col W Wesley Clemesha, I.M.S. (retired) whose experience and original investigation in tropical sanitary matters render him peculiarly fitted for this post. These Sanitation Supplements can be purchased separately from the Bulletin. They follow the usual lines of the Bulletin in reviewing and giving extracts from articles on special subjects of hygiene and sanitation likely to be of interest both to the hygienist and to the practitioner working in the tropics. The Bulletins are well illustrated with charts and pictures of interest. We intend to give extracts from these Sanitation Supplements from time to time and to draw attention to articles of interest to Indian medical men.

Recent Work on Diseases of the Heart

By CHARLES W CHAPMAN, M.D., M.R.C.P.,
Practitioner, February 1923

JOHN HAY considers cardiac pain an indication of functional disability rather than evidence of any particular variety of pathological condition. Many fatal cases of angina pectoris are negative as regards cardio-vascular disease. Epigastric pain of cardiac origin may be mistaken for dyspepsia and pain in the neck and arms from a similar cause may be mistaken for neuritis, especially when it is the dominant symptom. Cardiac pain is an evidence of cardiac exhaustion and an indication for rest.

Secher by experiments on rats, confirms the findings that acute over-exertion entails dilatation of the heart, which may be fatal, but he also finds that acute dilatation may retrogress.

Barach in tracing the exciting and predisposing factors in cardio-vascular disease from early infancy onwards found that any tonsillitis is a forerunner of rheumatic fever in many instances. In other cases there was a history of measles scarlet fever, rheumatic fever, diphtheria, chorea, growing pains, influenza or syphilis. The streptococcus is found in most cases.

Philip Norman considers arterio sclerosis to be the direct result of infection and advises careful searching for foci in the teeth, tonsils, sinuses, gall-bladder and the intestinal tract. The organism most commonly associated is the *Bacillus aerogenes capsulatus*. The author advises irrigation of the colon and sigmoid with 1 in 1,000 potass permang solution.

Craig draws attention to the frequently unobserved signs of aortic disease. The signs with pathological changes in the aorta such as elongation dilatation, sclerosis or inflammation of the aorta are—(1) dullness over the manubrium extending to the right in the second and third interspaces, with or without pulsation (2) accentuation of the second sound often clanging in character and frequently accompanied by a palpable diastolic shock, (3) systolic murmur at the aortic cartilage possibly transmitted to the vessels of the neck, and sometimes accompanied by a systolic thrill, (4) visible pulsation in the peripheral arteries.

Wolferth discusses the use of quinidine in auricular fibrillation. Twelve cases were treated, and the author after enumerating the possible disagreeable effects of the drug, insists on caution in its use. If cardiac embarrassment follows, the treatment should be discontinued.

The author remarks, in conclusion, that quinidine therapy is still in the experimental stage.

Caton emphasizes the importance of prolonged rest in convalescence from recent valvulitis. The doctor should see that the requisite rest is obtained. The writer has great confidence in the value of iodides during the rest stage. Vaguez and Leconte analyse their experience with over 1,000 cases of high blood pressure during 20 years. Over two-thirds were men, and all over 18. Among the facts brought out is the prognostic value of the water test. When the elimination of water after test ingestion was retarded, all in this group died within a year, or their conditions had grown worse during one to three years afterwards, only one failed to show any aggravation. Where there was normal response (23 out of 40 tested), there had been no sign of aggravation during the year except that two have died from cerebral lesions, the others have had no disturbance from this cause during several years.

Harold W Dana noted that cases classed as functional in children were later on found to have a mitral leak, he also found that those who had myocardial insufficiency had had measles a few months previous to the examination. When a child who shows no cardiac murmur before exercise develops a blowing systolic murmur at the apex as the result of running 40 paces, then that child has a myocardial insufficiency, has developed an acute dilatation of the left ventricle as the result of effort. It is suggested that, before a child, who has had any acute infectious disease, is discharged by his physician, the patient should be put through a mild effort test, and if the result is positive, physical exercises should be limited until evidence of disability has disappeared. In a child over 10 years old an apex beat more than 7 cm from mid-sternum indicates enlargement of the heart. In smaller children, the normal apex beat should not be more than from 5.5 to 6.5 cm from the medium line.

The Diagnostic Significance of Uterine Hemorrhage

By MALCOLM DONALDSON, F.R.C.S.,
Practitioner, Feb 1923

MALCOLM DONALDSON insists that it is our duty to educate the public so that a woman who has any irregular bleeding whatsoever will as surely go to consult a doctor and be examined as she would if she coughed up blood. It is a very common error to think that malignant disease of the uterus is confined to patients who have reached the age of 45 or thereabouts. It is true that carcinoma of the body of the uterus is almost unknown before the age of 40, but cases of carcinoma of the cervix often occur at the age of 30, and even at the age of 28.

When a patient comes complaining of hæmorrhage, the exact menstrual history should be obtained.

Carcinoma of the cervix exhibits very different characteristics to those of carcinoma of body. Cervical growths, in a very large majority of cases, are found in multiparous, carcinomata of the body in nulliparous women. The former are found at any age, they are not uncommon between 30 and 40, several have been noted at 18 years, and a case has been recorded in the literature as early as two years old. Corporeal carcinoma, on the other hand, is practically unknown before the age of 40.

The presence of a granular area which bleeds readily should always be viewed with suspicion, and a section removed for microscopical examination. Such a section can be removed without any anæsthetic, the cervix itself being insensitive, but it is better that this should be done at the home of the patient, so that she can remain in bed, for not infrequently plugging has to be resorted to for the purpose of controlling the hæmorrhage from the incised area. The positive or negative diagnosis of carcinoma of the cervix is really a more or less simple matter.

It is quite another story in the case of carcinoma of the body. The patient, usually a nullipara, is always over the age of 40 and frequently about the age of the menopause. The hæmorrhage usually starts as being slight, and on each occasion becomes more profuse. On examination, the cervix is found to be healthy, but bimanually the body of the uterus is felt to be somewhat bulky. The absolute diagnosis can only be made by diagnostic curettage, and this involves admission to a nursing home and administration of an anæsthetic.

Carcinoma of the body, unlike that of the cervix, spreads slowly, so that it is quite justifiable to treat a patient, in whom the hæmorrhage is coming from the cavity, by means of ergot, pituitary, or other drugs, for a period not exceeding four weeks. If at the end of that time the hæmorrhage has not improved, then it is essential to have a diagnostic curettage performed.

In those cases in which the patient is some years past the menopause hæmorrhage from the cavity should be considered as diagnostic of carcinoma of the body until disproved.

This question of malignant disease, developing in a case in which fibroids already exist, is really a very serious difficulty, and it is therefore desirable that operative measures should be undertaken in any such case, when irregular hæmorrhage occurs. On more than one occasion a fibroid known to exist before the menopause has given rise to hæmorrhage a few years later. This invariably indicates malignant changes.

It is of the very greatest importance that every condition should be excluded before the diagnosis of menopausal hæmorrhage is made, and it is well to remember that the symptoms of a normal menopause are either sudden cessation of all periods, or increased interval between periods, and a decreased loss during the periods.

Never treat a case of irregular hæmorrhage without examining the cervix. By such a procedure, which only takes a few moments, it is possible to exclude one of the most dreadful diseases that can befall a woman.

The Etiology of Gallstones.

By SYMMES F. OLIVER, M.D. (Cincinnati), O.

The Jl of Lab and Clinical Med, Jan 1923

DR OLIVER concludes that the probable steps in the formation of gallstones are as follow:

First, there occurs a bile stasis; this is probably most frequently brought about through infection. It is entirely conceivable, however, that stone formation may occur independently of infection. Any factor or factors responsible for bile stasis may be looked upon as predisposing causes.

Second, as a result of the stasis produced, a back-damming into the liver occurs.

Third, consequent on this change a certain degree of hepatitis and hepatic insufficiency occurs.

Fourth, as a result of this change in physical conditions and impairment of liver function the bile salts are not excreted into the bile as they normally are.

Fifth, if this condition is merely temporary a condition of "biliousness" probably exists which is relieved by cholagogue cathartics such as calomel and $MgSO_4$.

Sixth, if the condition extends over a considerable period of time the cholesterol of the bile is no longer held in solution and tends to settle out. It tends to collect around some foreign nidus, dragging down a certain amount of pigment and mucin with it. The development of these concretions tends to further increase the stasis present, and, if not relieved by drainage, must inevitably lead to further stone formation. If actual obstruction occurs, a vicious circle is established which can only be corrected by operative intervention. If the process has gone on for a long period the damage to the liver may be such that only temporary

relief will be obtained. This probably accounts for the numerous symptoms which sometimes persist after operation.

In reality we are dealing with hepatic disease even more than with disease of the gall-bladder. If the liver can be restored to a normal state, we have obtained a real cure.

ANNUAL REPORTS.

REPORT OF THE HEALTH OFFICER OF CALCUTTA FOR THE YEAR 1921

By DR H. M. CRAKE, M.D., D.P.H.,

Calcutta Corporation Press, March, 1923

THIS report, although somewhat belated, is a very interesting one. The weather of 1921 in Calcutta was distinctly abnormal, there being abnormally little rain in the first quarter of the year, and unusually little in August and September. The death rate, which in 1902 was 36.3 per 1,000, and had fallen in 1917 to 23.7 per 1,000, rose with the influenza epidemic to 42 per 1,000 in 1919, and in 1921 had again fallen, this time to 33.4 per 1,000, so that it may be assumed that the wave of the pandemic was over. Nevertheless respiratory diseases head the mortality, 7,211 deaths out of a total of 30,395. Small-pox was only sporadic, in place of the terrible epidemic of 1920, which caused nearly 3,000 deaths.

District No. 3, Kidderpore still retains its very high mortality, 41.6 per 1,000, whilst districts 19 and 20, Entally and Beniapooker are still centres with a death rate of between 40 and 50 per 1,000. It is a curious coincidence that a recent analysis of Dr Napier's cases of kala-azar from among permanent residents of Calcutta city shows that these three areas of the city are those especially from which such kala-azar cases come. With regard to sex incidence the death rate per mille was 44.1 for females as against 28.4 for males, and Dr Crake attributes this to the effects of the *purdah* system. Another factor, however, is probably dirty midwifery among women of child-bearing age.

Taking seasonal incidence it is clear that the hot weather is a relatively healthy period in Calcutta. The highest death rates occurred in February, March, and December, 41.2, 41.6, and 35.9 per mille. This is due in the spring to the influenza wave and in the winter possibly to recurrent influenza and malaria. The months June, July, August and September appear to show the lowest rates, 25.6 to 28.9 per mille.

Infant mortality reached the very high figure of 330 per 1,000 births registered but showed a very appreciable decline on the 1920 figures. The reduction in the death rate among children under ten years of age was no less than 30 per cent,—partly due to the relative absence of small-pox during the year. An all round reduction of 16 per cent in the male death rate, with a decline of from 20 to 30 per cent in four age periods is very satisfactory.

Of a total of 5,721 deaths among infants no fewer than 1,908 or 33 per cent occurred during the first week of life, and Dr Crake sums up the causes as poverty and undermined health on the part of the mother, child marriage, the *purdah* system, dirty midwifery and venereal diseases. 1,234 still births were recorded during the year. Half the total infant mortality occurs among babies under one month old. The comparative rates of infant mortality by castes is of interest: 36.9 per mille among Mohammedans, 32.5 among Hindus, and 24.5 among Indian Christians.

The birth rate was 19 per mille, an improvement on the 1920 figures. Certain wards however shew abnormal figures which can only be explained by defective registration. Here, as usual, there is a marked seasonal variation, a maximum of 237 per mille being registered in November.

Of the principal diseases cholera was unimportant in 1921, and small-pox only sporadic. Tuberculosis has shown a steady increase in the mortality figures ever since the influenza epidemic of 1918 and caused 2208 deaths in 1921. It has risen over 40 per cent since the pre-influenza days, and one of Bengal's most urgently needed institutions is a tuberculosis sanitarium for the city of Calcutta. Plague, once a factor of some importance in 1903, has almost disappeared from the returns. Cholera shewed its usual seasonal incidence, and its usual heavier incidence among Hindus, owing to their bathing in the Ganges and Tolly's Nullah. It is clearly water borne in Calcutta city and prevails in the riparian districts and wards. Malaria reaches a figure of only 14 per 1,000, but there is a corresponding rise in 'other fevers'.

Influenza was still prevalent, with tuberculosis as an aftermath, although the position with regard to the former was better than in 1920. It was epidemic only during the first half of the year, and was especially prevalent in the Kidderpore area, which had a death rate from this disease of 34 per mille as against one usually under one per mille for most of the city. Hindus suffered more severely than did Mahomedans, and males more than females. Young children were far more exempt than in the previous two years. Relief centres were opened in all badly infected areas, and tabloids and sprays issued.

General sanitary measures undertaken shew a steadily increasing total, 5,932 miscellaneous tasks as against 5,065 for 1920. Bakeries in Calcutta are noted as being places where insanitary conditions in general prevail, and which stand in need of rigorous inspection and reform. Grog shops and aerated water factories were systematically inspected. The attempts to get *gwallahs* to keep their cowsheds clean by offering monetary prizes failed; only two applicants entered for the Rs 400 prize for the best kept dairy. It is clear that the ordinary Calcutta *gwallah* prefers obscurity to fame, and dirtiness to either. What "milk" is like in the Presidency towns of India may be gathered from the report for 1922 of the Chemical Examiner to the Government of Bengal. More than 75 per cent. of the cattle-sheds in the districts especially concerned were improved however as a result of vigorous measures taken.

The department under Inspector Dr S N Ghose dealing with food inspection was very active throughout the year. In all 85 cases were conducted against the vendors of adulterated ghee, and 29 convictions obtained, a further 54 cases being still pending at the end of the year. Several confirmed offenders closed their shops and left the city after their wares had been repeatedly sampled. In spite of the defects in the existing law and the loopholes left for escape, the vigorous work of Dr Ghose has had valuable results. 5,380 samples of foodstuffs of all kinds were examined as against 3,611 in 1920. 45 per cent. of samples of ghee, 36 per cent. of samples of milk, and 25 per cent. of samples of mustard oil were found to have been adulterated. The new and very fine and cleanly milk block in the Sir Stuart Hogg Market was completed, and its introduction, with its test laboratory and very special facilities, should ensure a grade of milk hitherto not usually available in Calcutta.

Primary vaccinations shewed a slight falling off as compared with 1920, but revaccinations in many districts an increase. The work of the anti-mosquito brigades was rightly concentrated on the proved malarial areas, especially wards 19, 20, 21 and 24, selected for this purpose. The small legal powers of the staff militate against their success. The lady health visitors and midwives continued to carry out excellent work,

and each year, despite the unfortunate stringency of funds, the work of this department becomes of more and more importance in the public health of Calcutta. The mortality rate amongst infants delivered by the corporation midwives and attended to and kept under observation until they were three months old was only 41.3 as compared with 110 per thousand amongst others not so attended. The most interesting development of this branch of work is the establishment of baby clinics and milk depots by the Indian National Association and the St John Ambulance. In addition to the Anglo-Indian clinic in the Bow Bazar district, a second was opened at Lansdowne Lane, a beginning made at a third in Duff Street, whilst a fourth was in course of organisation in Kidderpore. The work of this self-sacrificing department and of Dr Winifred Rushforth deserves all encouragement and financial support on the part of the Calcutta business community.

The work at the Corporation Laboratory was in charge of Dr T K. Ghose, L.M.S., F.C.S., and, amongst many other activities, special attention was paid to analyses of the water from tube wells. The Vaccine Depot was in charge of Mr W. Sen Gupta, and the case successes were very good, 97 per cent. with four points and 94 per cent. with two points results which will bear comparison with those of the London Lymph Establishment. The pay of vaccinators has been improved and a better class of candidate is now coming forward. The Ambulance Service was under Capt. B A Westbrook, Chief Officer, Fire Brigade, and did excellent work. The introduction of the new ruling that calls in non-infectious cases other than accidents must be certified by a doctor did much to decrease the number of unnecessary and trifling calls.

Dr Crane is to be congratulated on a report which in general shews that the care of the public health of Calcutta city is in experienced and most capable hands that the aftermath of the influenza epidemic is being mastered and that in every department progress and increased vigilance are the order of the day.

ANNUAL REPORT ON THE HOSPITALS, DISPENSARIES, JAILS, REGISTRATION AND VACCINATION IN THE CENTRAL INDIA AGENCY FOR THE YEAR 1921-22

By C B McCONAGHY, M.B.,

L.T.-COL., I.M.S.,

Available from The Superintendent, Government Printing India, Delhi, 1923 Rs 2-12-0

THE total number of hospitals and dispensaries during 1921-22 in Central India was 224 as compared with 212 in the previous year, twelve new dispensaries having been opened. The total number of patients treated was 1,594,456 as against 1,561,318 in the previous year. Of the prevailing diseases malaria and diseases of the eye stand out prominently, being responsible together for almost one-third of the cases attended.

Colonel McConaghy notes that the King Edward Hospital at Indore, although doing splendid work, stands urgently in need of financial support. Clinical laboratory work in Indore State has nearly doubled its previous activities. The dispensaries maintained by Indian States continued to do satisfactory work. There are only four I.M.S. officers permanently posted in Central India out of 198 qualified medical men and women with registrable qualifications, so that this part of India affords a suitable example for study of conditions in the relative absence of the "senior service." The percentage of expenditure on medical services to total revenue in all the States of Central India still remains extremely small, varying from 1.23 per cent. to 5 per cent. in different States. Vital statistics are, at best, unreliable, and the recorded birth rate in 1921,

1186 per cent.,—whilst undoubtedly very much below the actual,—is still far better than the 7 to 10 per cent. rates recorded in 1919 and 1920

The death rate shews a remarkable decline from a total of 330,363 deaths in 1918 to only 58,914 in 1921 presumably owing to the subsidence of epidemic influenza. Vaccination has maintained its customary level, and the lymph prepared at Manipur has given good results.

Of epidemics, cholera was the most severe and gave 10,497 cases with 5,079 deaths in 1921 as against 278 deaths in 1920 and 8,309 in 1919. The Southern States' Agencies were the most affected and the outbreak appears to have been traceable to an outbreak at the Ujjain fair, attended by about three-quarters of a million persons from all parts of India. The epidemic lasted from May until well into October. Plague was of little consequence during the year. Influenza caused some anxiety in the Bundelkhand Agency during the first five months of 1921 there were 2,789 seizures with 398 deaths.

The jail population shews a very varying death rate, from 35.9 per mille in Bhopal State Jail to 158 per mille in Rewah State Jail. The latter figure is not explained. The King Edward Hospital Medical School, Indore, contained on the 1st January 147 students, of whom 28 qualified during the year.

Colonel McConaghy's report leaves us, we admit, with a feeling of depression. The Central India Agency was in the forefront during the war in peace it appears to be content to assume a backward and non-progressive place. Its resources are immense its medical and public health services,—it would appear,—entirely inadequate.

Reviews.

GREEN'S MANUAL OF PATHOLOGY AND MORBID ANATOMY. 13th (1923) edition. Revised and enlarged by Dr W Cecil Bosanquet and Dr G S Wilson Balliere, Tindall & Cox, London 624 pp, with 7 coloured and 244 other illustrations 21/- net

THIS well known and standard book has been the friend of both students and practitioners since its first edition in 1871. "Green" excels above all in morbid histology, and its numerous and well executed illustrations have always been a special feature of the book. Two new coloured plates have been added to the present edition, one of acute and one of chronic inflammatory conditions. A considerable amount of new material has been incorporated, many portions have been practically rewritten, and rearrangement of chapters and sections effected.

Turning to different pages one finds that the work is thoroughly up to date. Thus viruses of uncertain nature are well treated, and *Rickettsia* accepted as a genus with different species the authors agree with Dobell that the spirochaetes are probably of bacterial and not protozoal nature. The chapters on immunity, inflammation and repair, and the pathology of fever as a symptom are perhaps the best written in "Green," and do much to enhance the value of the book. The book represents the best of British teaching in pathology and morbid anatomy it has always been a favourite with both students and practitioners and is still issued at a very reasonable price considering its wealth of illustrations. The former arrangement of the book into Part I, general pathology, and Part II, diseases of special tissues and organs is still adhered to, and is one of special convenience and easiness for reference. The use of leaded type for sub-headings and a very complete

index increase the value of the book, which, we are glad to learn, is still in a state of "sustained vitality."

FRAMBOESIA TROPICA By R L Spittel, F.R.C.S (Eng) Balliere, Tindall & Cox, London 59 pp with 39 illustrations 5/- net.

THIS is an admirable handbook on a too-little studied tropical disease, and profusely and beautifully illustrated. In a preface the author states that the book professes to be nothing more than a clinical study of frambœsia, or *parangi*, as met with in Ceylon and, as a clinical study the book is admirable. We trust, however, that in any future edition, which will almost certainly be called for, the author will add the historical, experimental, serological and other data concerning the disease and expand his book into a complete and authoritative monograph.

The author does not share the views of Butler, Parham and others that yaws is "stone age syphilis" on the contrary he emphasises the clear differences between yaws and syphilis. Thus the primary lesion in yaws is almost always extra-genital the disease is never congenital, on the contrary children often infect their parents, the secondary lesions do not affect the mucous membranes or eyes, and alopecia is unknown the tertiary stage often sets in after a very prolonged interval of two to five years, during which the patient may seem almost free from symptoms yaws affects the internal viscera much less than does syphilis, and the central nervous system rarely, if ever the scars in yaws tend to be more keloidal and the disease in general to be more dermatropic and less visceralised than syphilis. Most workers with experience of both diseases will be inclined to agree with Mr Spittel.

Having described the primary sore, which is often very persistent, the secondary stage and the life history of a yaw, the quiescent period and "yaws reminders," the tertiary stage is well described, with an excellent account of the lesions in bones, joints, fascia and soft tissues. Diagnosis is treated mainly from the clinical point of view, emphasis being laid upon the type of patient "the victim of *parangi* is a guileless villager, whose constitution is not much affected by the disease. The subject of syphilis is a more sophisticated individual of the town with health apparently undermined."

Turning to treatment this is fully described. The author insists that in addition to the salvarsan derivatives, the position of iodides in the treatment of yaws, especially in the tertiary stage, is still a secure one. "We have no right to dispense with this valuable drug." For intravenous use he uses a combination of mercuric iodide, sodium iodide, phenolphthalein, and sodium hydrate in distilled water, giving 6 to 8 cc for six injections at 5 to 7 day intervals. His routine treatment is approximately (a) two injections of 0.6 gm neosalvarsan (b) then alternately four injections each of neosalvarsan and of the above mercuric iodide solution, all at weekly intervals (c) followed by a potassium iodide mixture, 5 to 20 grains, for 14 days and stopped for ten days recurrently during a period of six months.

Mr Spittel's little book is one which should be read by every medical practitioner called upon to deal with frambœsia. Not the least valuable features of it are the profuseness of its illustrations, 39 excellent photographs in 59 pages, and its low price, 5/-.

INTERNATIONAL CLINICS A Quarterly of illustrated clinical lectures and original articles Edited by H W Cattell, M.D. Philadelphia, with the collaboration of Chas H Mayo, M.D., Sir John Rose Bradford and others J B Lippincott Company, Philadelphia and London Vol III, 32nd series, 305 pp 42/- net per set of 4 vols

THE third volume of this well known series contains valuable contributions to medicine and surgery, together with seven specially prepared original articles. It comprises the best of teaching in both America and England.

Dr Sterling V Mead deals with the etiology and prevention of oral sepsis, an article profusely illustrated with X-ray plates and well emphasising that good dental work is, in the long run, cheap, and poor work expensive and purchased ultimately at a high price. Dr Charles Goodman deals with transplantation, giving many extracts from Carrel's well-known work, and a very complete bibliography. Dr Turck's paper upon shock and fatigue is perhaps the most notable of the special articles. Essentially, he claims, both shock and fatigue are due to the absorption of autogenous toxins, and full details of experimental tests with both are recorded. The experiences of the war have revolutionised our views of shock essentially in etiology we now recognise that it is due to the absorption from damaged or devitalised tissues of toxins with a profound influence upon blood pressure and cardiac activities. In fact shock can be produced experimentally by the injection into one animal of shock-toxins produced in another. Warmth is one of the most useful measures in combating shock, since it increases the formation of antibodies. The article by Dr E Bosworth McCready on feeble-minded and backward children is one which should be read by both laymen and medical practitioners interested in this subject. The influence of hereditary factors, such as alcohol and syphilis are fully considered and a table of development, both physical and mental, of the ordinary healthy child from birth to the age of 40 months is given which will be invaluable for reference. Having dealt with physical and mental examination, and appreciating the value of the Binet-Simon tests but refusing to accept them as the sole standard for investigation, the author concludes by an excellent account of how to bring up mentally backward, nervous and unruly children, with notes on stuttering and idioglossia.

Dr Henry Kraemer contributes a beautifully illustrated article on the cultivation of medicinal plants, in which he urges that more effort should be put forth to the improvement of cultivated strains. At present we rely far too much on wild plants, whose constituents and composition may vary widely, and under conditions entirely beyond control. A much better and more standardised pharmacopoeia might result if more attention were paid to experimental farms and cultivation of selected strains. Colonel W O Owen deals with the use of motion pictures in medicine, shewing how very valuable they are in the teaching of anatomy, surgery and, above all, of embryology, and especially emphasising the value of ultra-rapid cinema films. Dr James Burnet of Edinburgh contributes a review of rickets—a subject upon which he is an acknowledged authority, and pertinently enquires "after all, what is a vitamin?" The recognition of mild and usually missed cases is important. Catarrhal, nervous and vaso-motor phenomena often preceded the bony changes. Rachitic infants may put on weight rapidly and may appear plump, but careful examination will reveal the stigmata. In fact one well known advertisement of a patent food is that of a plump baby who shews unmistakable signs of rickets. He urges the abandonment of patent foods and milk preparations if the mother be unable to nourish her own child the only proper substitute is scalded cow's milk pure, or diluted with water.

Dr David Riesman comments on soreness of the tongue as an inaugural symptom of pernicious anaemia and Dr Peter Bassoe deals with the nervous syndromes produced by lesions of the spinal cord. This article is fully illustrated and one which will be of special interest to surgeons transverse lesions, pyogenic osteomyelitis, vertebral tuberculosis, malformations, and benign and malignant tumours of the spine are dealt with in turn, illustrated by a series of roentgenographs and Pal Weigert stained transverse sections. Dr A Weiese discusses the relationship of the biliary tract to typhoid infection, and Drs Julius Friedenwald and Theodore H Morrison contribute an exceptionally interesting review of the gastric disturbances of old age. From a study of 300 cases they conclude that these differ

in many respects from those occurring in younger individuals that infectious processes, degenerative processes and arterio-sclerosis play important parts in their etiology, together with changes in gastric secretion and motility and that such changes should be borne in mind when drawing conclusions concerning the diagnosis and treatment of these affections.

In the section on surgery, Mr Charles D Lockwood gives a splendid account of some newer aspects of thoracic surgery, profusely illustrated with radiographs and full page plates. The lessons of the War have revolutionized this branch of the surgeon's art, the thorax being now almost as open to operative procedures as is the abdomen. Thus in the French army the mortality of chest wounds was reduced from 45 per cent under expectant treatment at the beginning of the War to 10 per cent at the end of it and the importance of 'debridement'—or surgical cleansing of wounds and immediate eradication of all damaged tissue—has come to be recognised. Local anaesthesia and gas-oxygen anaesthesia are the best methods of lessening shock in chest operations. Non-penetrating wounds of the thorax often cause such serious intra-thoracic injuries as haemo-thorax and infraction of the lung the lung tissue itself is very resistant to infection but in severe chest injuries collapse of the lung is almost invariable and the relief afforded by firm closure of the wound in pneumothorax associated with a sucking wound of the chest is instantaneous and startling. The mediastinum is not to be regarded as a rigid partition, for injury to one lung and its collapse or empyema of one side is not without its effect upon the other lung. The value of X-ray examinations in thoracic injuries cannot be too strongly emphasised. Sinuses and old empyema cavities should be injected with bismuth paste before being X-rayed. Local anaesthesia, the application of bacteriology to a study of thoracic wounds and the Carrel Dakin method have brought thoracic surgery into a new and dominant position in post-war surgery and the authors treat accordingly of the modern post-war surgery of empyema, abscess of the lung, and advanced pulmonary tuberculosis. Drs George M Dorrance and J Wm Bransfield shew the value of alcohol injections for the relief of pain in malignant disease of the face, before or after operative measures and especially in the acute and intractable pain which sometimes follows radium treatment. The description of the technique adopted is full and detailed and well illustrated. Finally Dr John M Wheeler deals most ably with the use of skin grafts in plastic eye surgery and in such conditions as exenteration of the orbit, ectropion and symblepharon.

The whole volume is admirably edited and published and will be of interest to the physician, the surgeon, and the laboratory worker alike.

THE BIRTH AND EARLY DAYS OF OUR AMBULANCE TRAINS IN FRANCE, August, 1914
By Colonel G A Moore, C M G, D S O, John Bale, Sons & Danielsson, London 2nd 1923
edition 24 pp 1/- net

THIS little brochure, illustrated by five full page photographs gives an account of the difficulties encountered in the removal of casualties in France in the opening days of the war, and of the splendid way in which they were overcome. At the outbreak of war there was not a single motor ambulance or ambulance railway coach available in France for the British Expeditionary Force, whilst none could be spared from England. The War Office however, had foreseen this difficulty and had devised the Brechot-Despres-Amelines stretcher—carrying apparatus which could be erected in any goods truck or empty carriage and would accommodate three lying down cases with their stretchers, and over 600 sets went to France with the first troops sent. On August 17th the French railway authorities made over 100 wagons, the first beginnings of the British Ambulance Train service, and on the 26th Nos 1, 2 and 3 ambulance trains steamed out of

NOTICES.

INDIAN MEDICAL SERVICE DINNER

The annual Indian Medical Service dinner in London will be held at the Trocadero Restaurant on Wednesday, June the 20th, 1923

"THE SIR WALTER BUCHANAN SCHOLARSHIP, EPSOM COLLEGE"

IN view of correspondence and enquiries regarding this scholarship we reproduce below, from the *Indian Medical Gazette* for August 1922, the rules and regulations regarding it

"The Sir Walter Buchanan Scholarship is primarily intended for the sons of deceased or prematurely invalided Officers of the Indian Medical Service, or failing any such candidates, for the sons of legally qualified medical men of pure British parentage in necessitous circumstances, who have practised medicine for at least five years in India

1 The value of the Scholarship shall be the income of the investments representing the Fund

2 The Scholarship shall be awarded by the Council

3 Awards shall be in the absolute discretion of the Council

4 The age limit for candidates shall be the same as that for the time being in force as regards Council Exhibitioners

5 There shall not be any competitive examination, but no candidate shall be accepted unless he reaches the standard required for Council Exhibitioners, and unless his general character and physical condition, as well as his mental capacity, are satisfactory to the Council

6 A successful candidate, unless already in the College, must enter at the commencement of the term next succeeding his election, unless the Council for some special reason otherwise determine

7 The Scholarship shall be tenable so long as the successful candidate remains at the College, subject to satisfactory periodical reports as to his conduct, progress, and physical conditions

8 The bestowal of this Scholarship does not in itself exclude a boy from holding any other Scholarship, excepting a Foundation Scholarship"

BRITISH INDUSTRIES FAIR

London, February 19 to March 2, 1923

Exhibit of Burroughs, Wellcome & Co

Of the achievements of British science and industry in the department of fine chemicals production, no better example could be desired than that presented at the British Industries Fair by the display of Messrs Burroughs Wellcome & Co. Special prominence was given to the 'Wellcome' Bismuth Salts, products which attain an exceptionally high standard of purity and remarkable chemical and physical uniformity. Equally notable were 'Wellcome' Sodium Salicylate, physiologically pure, in non-caking flakes, and the large numbers of alkaloids and alkaloidal salts issued under the same brand

Of the many other medicinal preparations shown, one of the most interesting was 'Moogrol,' a very promising therapeutic agent for use in combating leprosy. Though but recently made available for general use, 'Moogrol' represents the outcome of patient and laborious investigations dating as far back as 1904. In its finished state as exhibited, 'Moogrol' is a limpid, colourless oil (presenting a mixture of esters of acids of the chaulmoogric series), eminently suitable for intramuscular and intravenous injection. Reports of therapeutic trials indicate very encouraging results from this means of treatment

A display demonstrated the successive stages in the production of 'Kharsivan' and 'Neokharsivan,' the all-British preparations, which, as proved alike by experimental investigation and clinical trial, successfully replace salvarsan and neosalvarsan. The production by Burroughs Wellcome & Co of these synthetic preparations within a short time of the outbreak of the late war constituted one of the most triumphant vindications of the British chemical industry

Details of the preparation of 'Tabloid' gland products and of 'Iodicin,' an organic combination admirably adapted for the intensive administration of iodine, were also shown in striking fashion. Displays of sera, vaccines and tuberculins, of microscopic stains, of medicine cases, and of a host of 'Tabloid' and 'Soloid' products further illustrated the wide range of this firm's activities

A CHEMICAL FILM

AN interesting film picturing the various processes in the manufacture of chemicals in E. Merck's factory at Darmstadt was shown at Madan's Theatre and Palace of Varieties, Calcutta, on Saturday afternoon, the 10th March, 1923, before a large gathering, who had been invited to witness it by Messrs Martin & Harris of 8, Waterloo Street, Calcutta, who are sole distributing agents of Merck's products in India. Besides interesting views of the works, the details of manufacture and the special methods adopted to ensure purity of the chemicals, interesting side-lights into the welfare work of the employers on behalf of the workers were also given

Notice.

SCIENTIFIC Articles and Notes of interest to the profession in India are solicited. Contributors of Original Articles will receive 25 Reprints *gratis*, if asked for at the time of submitting their manuscripts

Communications on Editorial Matters, Articles, Letters and Books for Review should be addressed to THE EDITOR, *The Indian Medical Gazette*, c/o Messrs Thacker, Spink & Co., P O Box 54, Calcutta

Communications for the Publishers relating to Subscriptions, Advertisements, and Reprints should be addressed to THE PUBLISHERS, Messrs Thacker, Spink & Co., P O Box 54, Calcutta.

Annual Subscription to "*The Indian Medical Gazette*," Rs 16 including postage, in India Rs 18 including postage abroad

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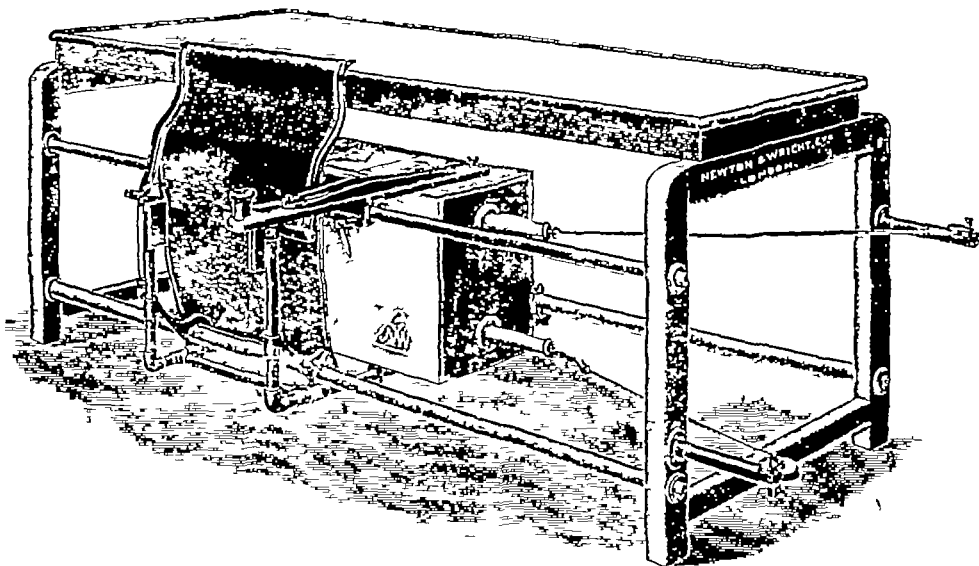
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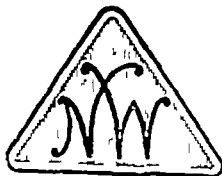
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GLUCOSE TOLERANCE TESTS AND THEIR INTERPRETATION

By J P BOSE, M.B.,

Dr Mitra Research Scholar,

Calcutta School of Tropical Medicine and Hygiene,
Calcutta

WITHIN the last few years, a revolution has taken place in the methods of investigation and study of metabolic diseases such as diabetes and especially in investigations from the point of view of biological chemistry. Previously stress was laid on urine analysis only but the results obtained were not very satisfactory. Later on the importance of chemical analysis of the blood was recognised, but the analysis was not done *before and at short intervals after a test-meal* and so the practical distinction between simple glycosuria and true diabetes mellitus was not made.

Quite recently, however, the *glucose tolerance test* with simultaneous analysis of the blood and urine has come into practice. This is considered to be not only the most delicate and accurate method of differentiation between simple glycosuria and true diabetes mellitus, but it also throws considerable light on the confirmation of the diagnosis of some other diseases which are associated with a disturbed carbohydrate metabolism. The recent great advances in the technique of micro-chemical methods of blood analysis have solved a difficult problem which greatly handicapped our predecessors. They have rendered possible the repeated estimation of blood-sugar after the ingestion of glucose and the *glucose tolerance test* has consequently developed along newer and more scientific lines. Formerly, this test was done by giving the patient glucose by the mouth and examining the urine for evidence of glycosuria every hour for three to four hours. But it is evident that this was unsatisfactory. Factors such as the difference in the renal permeability to sugar were not recognised and individual variations in respect to tolerance to glucose, etc., often stood in the way and made the results inconclusive.

The observations laid down in this paper were done in London by Dr MacKenzie Wallis, Chemical Pathologist to St Bartholomew's Hospital and myself. We did a large number of *glucose tolerance tests* on hospital patients without any information at the time of the nature of the diseases from which the patients were suffering. We plotted these out on a large sheet of graph paper and picked out all the curves which showed the same type of response and marked them. Of course we did controls on normal healthy individuals also. After this we went over the clinical notes of all these patients with a view to see what

relation, if any, existed between the clinical diagnosis of the cases and the types of curves obtained in the laboratory. We got very interesting and striking results. We found that some of these types of curves could be associated with definite diseases. Thus definite types of curves, which were quite distinct from one another, were obtained for certain disorders of the ductless glands,—such as hyperthyroidism, hyperpituitarism and hypopituitarism. Still more striking was the sorting out of a rare variety of kidney disease, with abnormal amounts of sugar in the urine, but with a normal or even subnormal blood-sugar. This disease up till quite recently could in no way be differentiated from diabetes mellitus, but the present-day view of the disease is that it is a simple glycosuria, which can be compared to that produced by phloridzin and has been termed "renal glycosuria." In these cases the diet has little or no influence on the excretion of sugar in the urine. The blood-sugar curves, after a test-meal in these cases, are quite striking, as the chart appended will show.

After associating definite types of blood-sugar curves with definite diseases, we next took up the investigation of cases with undoubted symptoms, which clinically had been diagnosed as Graves' disease, early cases of acromegaly, Frohlich's syndrome and renal glycosuria—and the results of this investigation confirmed our previous observations. The value attached to these *glucose tolerance tests* cannot be over-estimated. Research is now being fruitfully directed towards the borderline cases—the beginnings of disease—and happily our present-day laboratory methods enable us to pick out many indefinite diseases and place them in their proper positions. This is a very valuable step in advance, as the indications for treatment become simple and precise.

I next pass on to describe the findings for blood and urinary sugar in healthy normal individuals. Though there was much controversy among physiologists of former times as to whether the urine normally contained any sugar or not, it has been shown by such workers as Folin, Benedict, Osterberg and others that normal urine does contain some amount of glucose and the investigations which Dr MacKenzie Wallis and I carried out in London in this line also confirmed the results obtained by these workers. We succeeded in finding out a new colorimetric method for estimation of the sugar in normal urine, and we described the method in detail in a paper published by us in the *Journal of Obstetrics and Gynaecology of the British Empire*, Vol 29, No 2, 1922. The figures for normal urinary sugar which we obtained varied in amount between 0.06 per cent to 0.11 per cent, the figure for normal blood-sugar varied between 0.08 per cent to 0.11 per cent. These are figures for Europeans. The figures I have obtained in India since my return from England vary between 0.08 per cent to 0.15 per cent in the urine and are nearly the same in the blood of normal healthy Bengalees. I

intend to make blood and urinary sugar determinations of normal healthy people of different provinces of India, and hope to publish my results later

It will be seen that in healthy normal individuals the concentration of sugar in the blood and urine is nearly equal. This normal urinary sugar cannot, of course, be detected by the ordinary chemical tests, such as Fehling's, Benedict's, Nylander's, etc.

It has been found by experiments that after the ingestion of glucose the urinary sugar runs parallel to that of the blood up to the latter's concentration of an average of 0.17 per cent. As the blood-sugar increases beyond this point the kidneys begin to excrete sugar. This point of concentration of blood-sugar has been described as the "*renal threshold*" or "*the leak point of the kidneys*". The different figures obtained by different workers are noted below.

Jacobson	About 0.174 per cent
Bailey	About 0.167 per cent
Hamman & Hirschman	Average 0.17 per cent

As the result of my experiments the leak point for Indians is an average 0.180 per cent. In this connection, I might mention that this *leak point* is not at all a constant factor. It varies in different individuals, and often in the same individual under different conditions. Thus a diabetic in the early stages of the disease may have a normal *leak point* or one somewhat lower, but under treatment his *leak point* may go up and it is a common finding to get a cured diabetic patient with the blood-sugar content much higher than normal, but without abnormal amounts of sugar in the urine.

I next wish to describe the *glucose tolerance test*. It has been found by experiment that a normal healthy individual can absorb 100 grammes of glucose without the appearance of abnormal amounts of sugar in the urine. But if the dose is doubled there is always a temporary glycosuria. By giving glucose by the mouth and examining the urine for evidence of glycosuria, it has been found that the limit of tolerance for glucose in normal individuals is about 150 grammes.

To do the glucose tolerance test the patient is given a light meal in the morning, consisting of one egg and tea or coffee, without sugar. Three hours later the urine is collected, measured, and the amount of urinary sugar estimated. At the same time the blood-sugar content is also determined.

The patient now consumes 50 grammes of glucose dissolved in 150 c.c. of water. This amount of glucose has been found to be sufficient, since it is the type of response we are gauging and not the actual amount of sugar in the blood, at any given moment. Further, for every given individual, the type of curve obtained is identical in form whether 25, 50, 100 or 150 grammes of sugar are given.

Exactly 15 minutes after the last drop of sugar solution has been consumed, the blood is taken again and the sugar content estimated. The blood-sugar estimation is repeated at $\frac{1}{2}$ hour, 1 hour, $1\frac{1}{2}$ hour and 2 hour intervals after the sugar has been consumed. At the end of one hour and 2 hour intervals the urine is collected, measured, and the amount of sugar present determined. In this way we have figures for the blood-sugar before the test and $\frac{1}{4}$ hour after, $\frac{1}{2}$ hour and 1 hour, $1\frac{1}{2}$ hours and 2 hours after the test. The charts appended illustrate the *glucose tolerance test curves* in (1) normal healthy individuals, (2) hyperthyroidism, (3) hyperpituitarism, (4) hypopituitarism and (5) renal glycosuria.

Conclusions

By means of *glucose tolerance tests* it is not only possible to differentiate simple glycosurias from true diabetes mellitus, but they also throw considerable light on the confirmation of diagnosis of some other diseases associated with disturbed carbohydrate metabolism. Definite types of blood-sugar curves can be obtained for certain disorders of the ductless glands, such as hyperthyroidism, hyperpituitarism and hypopituitarism, and a rare variety of kidney disease, which have all along been masquerading as diabetes mellitus. These can be sorted out by this test.

A PLEA FOR THE INCEPTION OF A MENTAL HYGIENE MOVEMENT IN INDIA

By OWEN A. R. BERKLEY HILL, M.D. (Oxon),

MAJOR, I.M.S.,

Ranchi European Mental Hospital, Ranchi

It is probable that the past year will be remembered in future as one which was associated with an epoch for psychiatry in India, as far as this branch of medicine can be said to exist at all in this country.

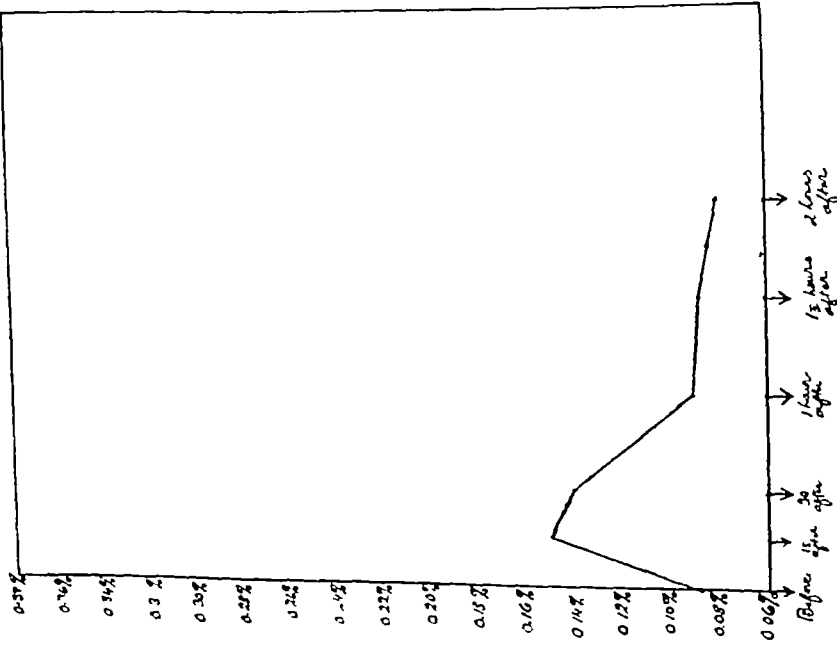
In April last year, the Government of India issued a memo to the Local Governments in which it was decreed that with the approval of the Local Government concerned the name Mental Hospital could in future be substituted for Lunatic Asylum. I suppose that this change in nomenclature has meant very little to most people, but to those who had been doing all that lay in their power for years past to bring this change to pass, this memo of the Government of India brought immense delight, for it meant to them the inauguration of the first step towards the hospitalisation of the Asylums in India and all that should follow from this, namely the beginning of an extended interest in psychiatry in all its branches.

It may be said quite fairly that outside the walls of the Mental Hospitals, the field of psychiatry in India is a neglected waste. Outside the hospitals skilled psychiatrists are

GLUCOSE TOLERANCE TESTS AND THEIR INTERPRETATION

By J P. BOSE, M B,
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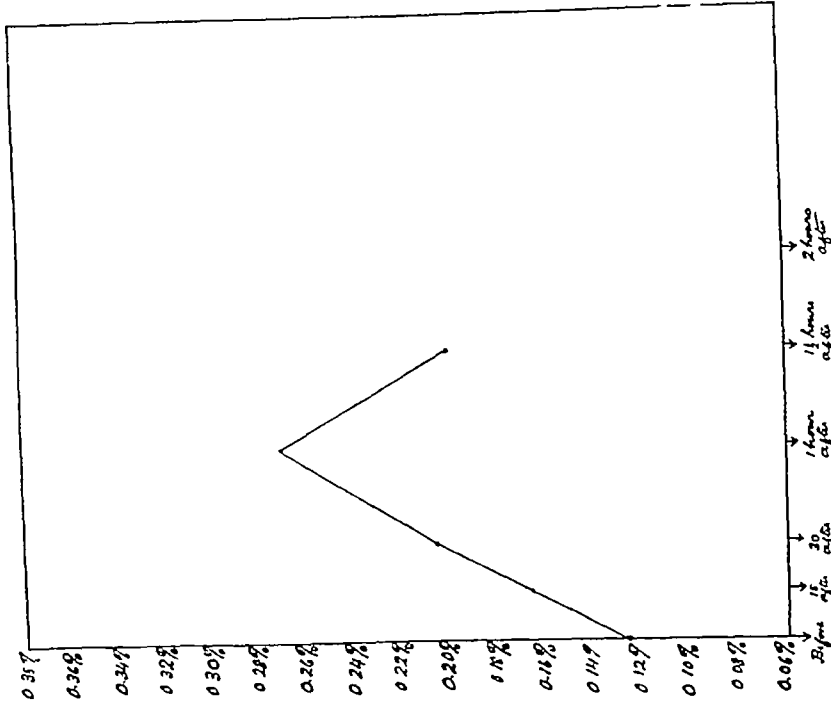
CHART I



NORMAL, HYPOTHYROID INDIVIDUAL

This chart illustrates the normal response to the ingestion of 50 grammes of glucose. The blood sugar before the test was normal (0.08%) and so was the urinary sugar (0.094%), the maximum rise was in $\frac{1}{2}$ of an hour's time and it was much below the *lact point*. The drop to the normal level was in an hour's time. The urinary sugar at the end of 2 hours was also normal (0.104%).

CHART II

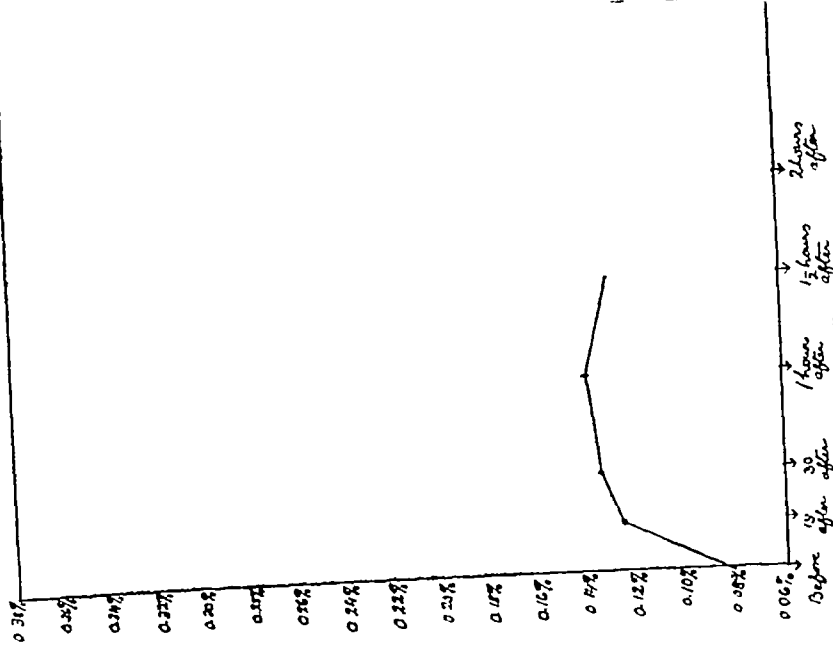


HYPOTHYROIDISM

The blood sugar before the test (0.125%) was slightly raised (according to European standard) and so was the urinary sugar (0.188%). The maximum rise was in 1 hour's time instead of in quarter of an hour, and at the end of 1 1/2 hours the blood sugar level was still high. There was an increase in the urinary sugar content after the test (0.568%).

- The noteworthy points about this curve are —
- (1) The steep rise
 - (2) Maximum rise in 1 hour
 - (3) The high peak

CHART III.



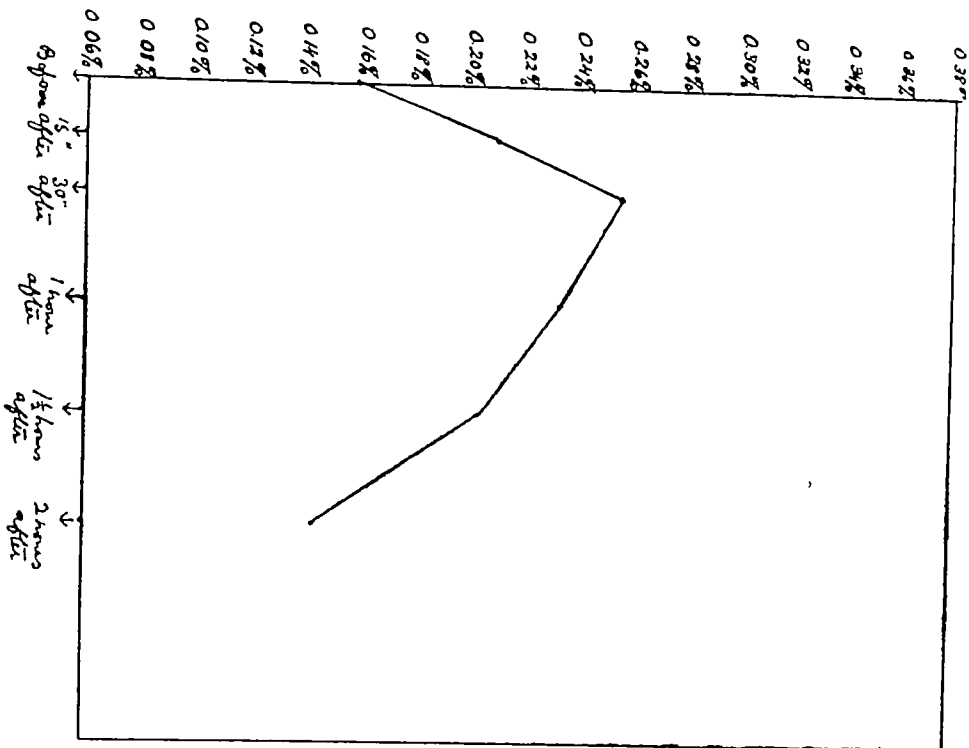
HYPERTHYRITARISM

The blood sugar before the test (0.082) though normal, was associated with glycosuria. After 50 grammes of glucose, the blood sugar showed a steady rise and the maximum rise was at the end of hour.

There was a rise in the glycosuria after the test. The flattened top and the long drawn out blood sugar curve is considered to be typical of cases of this nature.

N.B.—The glycosuria in this case was intermittent as it is in most of the cases of this type.

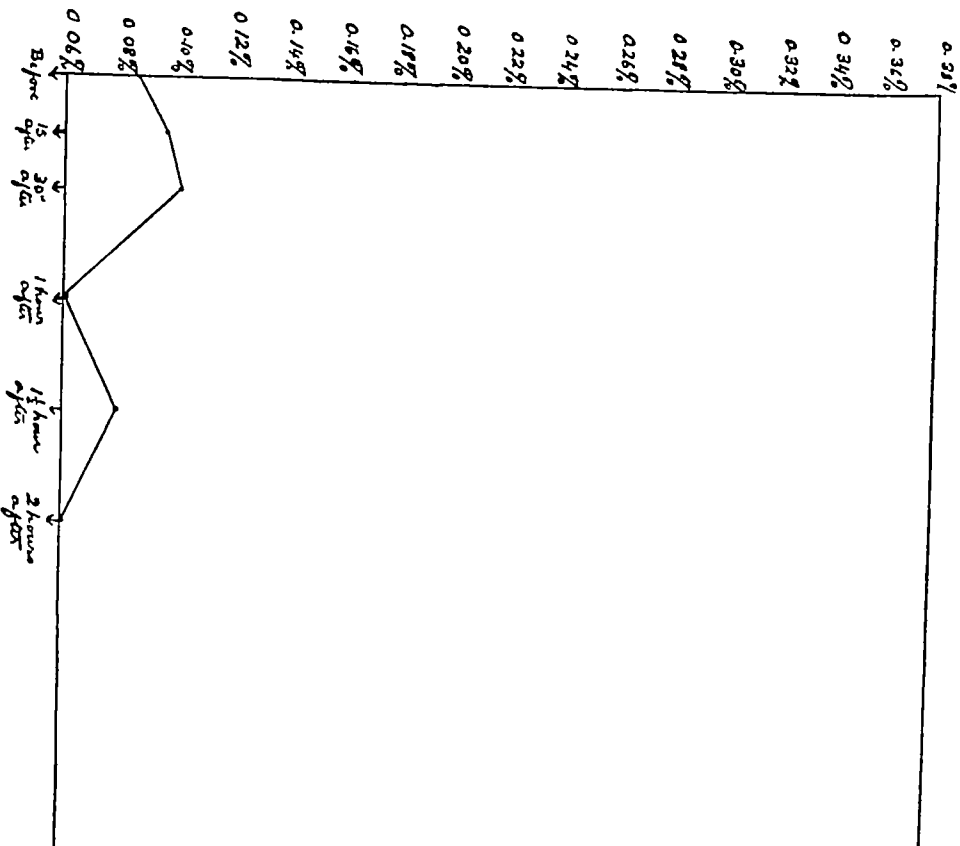
CHART IV



HYPOPARATHYROIDISM

The blood sugar before the test was raised. The urinary sugar before the test was normal. The maximum rise was in half an hour's time and though the blood sugar level shot up quite high (0.258%), which is much above the *leak point* level) the urine did not contain any abnormal amount of sugar at the end of 1 hour and 2 hours. This chart illustrates the increased tolerance these patients have for carbohydrates.

CHART V.



RENAL GLYCOSURIA

Though the blood sugar level before the test was quite normal (0.084%), the urine showed evidence of definite glycosuria. The maximum rise is in half an hour, and within 1 hour the blood sugar falls to a very low level. The blood sugar rises and falls again in the course of the next hour. This chart illustrates that the test meal did not influence the blood sugar content very much.

extremely few in number. In many of the largest towns in this country there is not a single specially qualified physician to whom a mental case can be referred for advice and treatment. As far as I am aware this is true of the three wealthiest cities in India,—Calcutta, Bombay and Karachi. What makes this fact the more deplorable is that this situation is apparently accepted by the medical profession as well as by the public, and that too without protest or effort at correction. Presumably the medical and the general public consider special knowledge and skill to be indispensable for the proper management of a Mental Hospital, but there is no evidence available that they hold this view in respect to the treatment of the individual before his admission into a Mental Hospital nor after he is discharged therefrom. Even the discharge of a proportion of the patients admitted into the hospitals, when cured or improved, has failed to convince the public or even the medical profession of the value of the application of equal knowledge and skill to the early stages and less incapacitating forms of mental disorders or to the conditions out of which they arise. In India there is at present hardly a sign that the advantages of a wider application of psychiatric knowledge and skill are beginning to be realised. Therefore it would appear to be imperative that a beginning should be made in this country to take practical steps to extend the activities of the existing hospitals as well as to start other agencies for psychiatric work. In Europe but more especially in America there is at present a rapidly developing mental hygiene movement the fundamental aim of which is to spread abroad the knowledge gained in the medical studies of mental disorders, and to promote in every possible way its effective application to the problems occasioned by these disorders in the individual as well as in the social body. There is a widely prevalent view that the study and practice of psychiatry can be of service only in the treatment of hopeless conditions, but through the extension of the knowledge already at our disposal, the value of psychiatry in dealing with individual and social conditions which are remediable will be demonstrated practically and accepted. The manner in which as well as the extent to which the Mental Hospitals in this country can broaden their field of usefulness must vary with the standards reached in the work of each hospital. Unfortunately, these standards vary very widely. There are still some parts of India in which even the simplest principles of intelligent and humane care have not yet found full acceptance and application, so that persons suffering from mental disorders are permitted to languish in misery and neglect in jails. Nevertheless, whatever the system or standards may be, they are likely to

be improved by extension work and one of the most effective measures to this end has been found to be the establishment, wherever possible, of out-patient clinics. Thus in the state of Massachusetts nearly all the hospitals conduct out-patient clinics. The largest of these clinics is at the Psychopathic Hospital at Boston. The number of visits made to the Massachusetts clinics during a period of three months was 2,676. A large proportion of those who attended had not been state hospital patients, and 125 were children who were sent to the clinics from the schools. The clinics need not be conducted solely at the hospitals but may be situated at convenient points in a district. The existence of these clinics brings the psychiatrist into touch with the general medical practitioners in a way that is mutually helpful. The latter get an opportunity to see the psychiatrist at work on cases with which the practitioner is familiar and any help given tends to increase his interest in and respect for psychiatry, not to mention his inclination to support the hospital. The educational value of such clinics may be advanced further by talks to school teachers whose pupils have been examined at the clinic, as well as by the giving of advice to parents and guardians. Activities of this sort not only bring relief to sufferers, but help to create among the public a feeling of confidence in the hospital, than which latter nothing is more to be sought after especially in India.

In 1916 there was founded the National Committee of Mental Hygiene of the United States which began to issue in 1917 a quarterly journal called *Mental Hygiene*. Its general purposes are outlined in the following statement—

"The National Committee for Mental Hygiene and its affiliated societies and committees are organised to work for the conservation of mental health, to help prevent mental and nervous disorders and mental defects, to secure and disseminate reliable information on these subjects and also on mental factors involved in problems related to industry, education, delinquency and the like, to aid ex-service men disabled in the war, to co-operate with federal, state and local agencies, and with officials and with public and private agencies whose work is in any way related to that of a society or committee of mental hygiene."

Recently in England a Committee of Mental Hygiene has been appointed with Sir Courtland Thompson as its president. Its object is to carry out a programme of mental hygiene on somewhat similar lines to that of the United States.

In France there is a similar movement on foot under the patronage of the Minister of Health. It has too its own journal. Along what lines we in India should

an organisation of mental hygiene, it is not easy to form an opinion. I would like, however, to make the following suggestions. To begin with each Presidency should start by procuring two or three qualified men. I am very glad to say that the Province of Bihar and Orissa has set a good example in that it has already sent to London a civil assistant surgeon to take the Diploma of Psychological Medicine. This is a very small beginning but it is one in the right direction and one that might be very well imitated. The next move must be in the direction of starting a psychopathic ward in every hospital throughout the country which is a teaching centre. Besides their ordinary work in connection with the psychopathic ward which would, of course, include regular instruction to medical students, the medical staff would organise the spread of psychiatric knowledge among the more intelligent inhabitants of the great towns. Working in close co-operation with the local magistrates, they would be in the position to aid materially in respect to the proper judicial treatment of mentally deficient offenders against the law, much after the fashion of Dr Potts and Dr Hamblin-Smith in the courts of Birmingham. They would also work in close co-operation with the Jail and Education Departments both of which are in urgent need of the advice of a competent psychiatrist. They would keep in close touch with philanthropic and missionary societies and by organising lectures and demonstrations help to arouse their interest and secure their assistance.

To these proposals there will be raised, of course the inevitable objection that there is no money for them. To those who take up this attitude (and there are many), it may be said that money spent judiciously on a psychiatric branch of public health will be more than recouped in a few years, as work of this sort must lead inevitably to the diminution of the present steady flow into our Mental Hospitals of so many hopeless cases. Our Local Governments do not yet realise that one mental disorder, namely dementia præcox, probably costs this country more in maintaining its helpless victims for life than any other single disease. Anyhow I would like to recommend to their notice the finding of a special recess committee of the Massachusetts legislature which was convened recently to investigate conditions prevailing in its state institutions. The attention of this committee was called to the enormous sums spent annually for the maintenance of these institutions but in spite of this the committee made this encouraging comment "The sum spent for research into the cause of disease and conditions resulting in the need of these institutions is negligible. The committee believes that research work in the field of mental disease and

defect should be pursued aggressively on a much larger scale. In this way only can it be hoped to make available information that will prevent, in the future, a heavier burden upon the State."

CHOLELITHIASIS AND ITS SIGNIFICANCE

By VERNON N. WHITAMORE,

MAJOR, I.M.S.

THE study and investigation of biliary concretions, their source and their subsequent history with the concomitant symptoms, obscure or marked, is a subject attracting considerable attention both theoretically and clinically. Coincident with the condition of cholelithiasis the condition of cholecystitis must *pari passu* be considered. Anatomically the mucous membrane of the gall bladder presents a structure peculiarly liable to the deposition and retention of a solid deposit, and prone to infection, not only on account of its direct communication with the intestinal canal, its rich double distribution of lymphatics and its blood supply, but also from its architecture—being the blind alley of a long and somewhat tortuous canal with a valvular mucosa, as far as the cystic duct is concerned.

Mechanism of the Bile Reflex—Reciprocal innervation is operative in the gall-bladder from the vagus and coeliac sympathetic. Stimulation of the sympathetic leads to contraction of the gall-bladder, and dilatation of Oddi's sphincter. Stimulation of the proximal vagus produces the same effect. Stimulation of the distal cut vagus produces dilatation of the gall-bladder and a closure of Oddi's sphincter. During fasting the gall-bladder remains atonic, and Oddi's sphincter tonic. Thus stimulation for normal contraction of the gall-bladder produces relaxation of Oddi's sphincter. The products of normal protein digestion are the best stimulus for this purpose. A vegetarian diet does not act to the same extent and indeed is a poor stimulus for bile outflow, and *per contra* an exaggerated acid gastric content tends against the effective relaxation of Oddi's sphincter. In addition to the bile reflex mechanism, the gall-bladder has an additional nerve supply from the phrenic, and referred pain from the gall-bladder is directed to the right half of the epigastrium, the right shoulder or the posterior cervical region, the afferent impulses in the latter areas passing by the phrenic. The visceromotor reflex is to be found when present in the upper part of the right rectus. The centres for the gall-bladder and stomach occupy the same segments in the spinal medulla, and as both viscera are supplied by the vagus, and as both viscera are supplied by the vagus, symptoms due to visceromotor and sensory reflexes are very similar in both cases, an obvious result of which is the liability to error in diagnosis.

Physiologically all the constituents essential for biliary concretions are present in the bile in a

the of colloidal emulsion, the cholesterol being held in this state by the fat present, and a faulty metabolism, with which is often associated an infection disturbing the normal metabolism of the mucosa leading to a precipitation of the cholesterol. This does not necessarily become a permanent deposit as the cholesterol may be again taken into suspension when, or if, normal function is restored, but with every repetition of this disturbance, and what is almost a certain sequela, *viz*, the invasion of a debilitated mucosa by bacteria and stasis of bile a vicious circle is created and results in cholelithiasis, the gall bladder becomes the charnel-house of dead bacteria, and superadded is a mucous membrane irritated by bacterial toxins and reduced to a condition of inactivity and fibrosis or of necrosis, calcification or even gangrene.

The experimental evidence with regard to the contents of the biliary passages is a subject of considerable interest. The method of investigation consists in siphoning the contents of the duodenum at about the level of the papilla of Vater. A thin tube of special construction with an ovoid extremity is swallowed and passed in much the same way as a stomach tube. The gastric end is allowed to stay in the stomach with the patient lying in the dorsal decubitus, after three-quarters of an hour the patient lies on the right side to facilitate the passage through the pylorus, a pump is then fitted to the extremity projecting from the mouth, and from time to time the contents are withdrawn, until by their character the operator is satisfied that the contents returned are duodenal in character. The solution of mag sulphate is then drawn into the syringe pump—a 20 c.c. syringe—and the solution forced slowly into the duodenum. After spraying the duodenal mucous membrane with a 20–25 per cent solution of mag sulphate which brings about an inhibition of Oddi's sphincter and a reflex contraction of the gall-bladder, the bile thus tapped bears the characters, from the onset of flow, of bile first from the common duct—a viscid dark yellow fluid, then from the gall-bladder, a mucoid viscid golden fluid, and finally from the liver, a fluid of a bright yellow colour free from mucus. This method of exploration has passed from the experimental to the clinical stage, its potentiality for purposes of diagnosis is obvious.

From a physiological point of view, and quite apart from bacterial infection it is conceivable that the formation of gall-stones of an aseptic character does occur. These are usually single stones and consist of pure cholesterol, a faulty metabolism of the mucous membrane and a condition of stasis being the main factors in their production. In their early stage, and unless they produce mechanical obstruction, these stones are often practically symptomless, later they may give rise to damage of the mucosa, and create a focus for infection, or occlude the cystic duct and bring about the state of cholecystitis, mucocoele or biliary colic.

Paths of infection—The gall-bladder from its anatomical associations may be infected from the duodenum by direct continuity of spread, or invasion along the submucous lymphatic route, or by retrograde mucous currents, the focus of infection originating from a duodenal delay resulting from angulation, ileus, etc., or from intestinal stasis, by whatever cause this may be produced, visceroptosis, etc. Infection may also occur from a gastric or pancreatic focus, the retro-peritoneal lymphatic distribution in this area being closely associated and in direct communication with that of the biliary passages, and of course *vice versa*.

2 Infection may be conveyed by the portal vein or

3 By means of the cystic artery, this is probably an important source of infection. The investigations of Peterman and Elz throw considerable light on these points and the researches by Rosenow on focal infections add considerably to our knowledge of gall-bladder infections and the possibility of systematic infection. The organisms incriminated are the *Streptococcus* foremost and the *B coli* and *B typhosus*, etc., second.

The nature of gall-stones—These may be either of pure cholesterol with a nucleus of mucoid substance, blood clot, etc., but usually consist of cholesterol and bilirubin calcium with a bacterial nucleus, their consistency depending on their nature and the amount of the calcium salt present. Their colour varies according to the amount and nature of the pigment in cases of long standing the colour is deeper.

On section the stones present a laminated appearance with alternating layers of cholesterol and the bile salts of calcium, and their shape varies in every degree according to their number and the pressure they are subjected to.

Symptoms—In the prodromal and early stages these may be, and usually are of an extremely mild character. The individual being often of a lethargic type and inclined to corpulence, attributes them to a passing attack of some form of dyspepsia, if indeed he complains at all. The sensation of fullness after meals and epigastric discomfort and flatulence to commence with is hardly noticeable, and soon passes off and is assigned to some error in diet. This condition recurs at intervals, and instead of being an occasional occurrence becomes almost a usual one, even then it may not cause serious discomfort. These may or may not be associated with an attack of jaundice probably of a mild and transient character with due care these symptoms subside and may even be entirely corrected. Once liability to the condition has been created it is only too prone to recur. Nausea without vomiting and perhaps attacks of giddiness are then associated with epigastric discomfort and flatulence and one is apt to be misled into thinking of gastric, duodenal, or appendicular dyspepsia. It may however be accompanied by viscerosensory reflexes or pains referred to the area between the shoulders, or even to the cervical

region. The attacks become more persistent and in addition to the above symptoms pain may occur in the region of the gall-bladder, of a dull aching character—it is not necessarily acute at this stage. Attacks of shivering occur due to toxic absorption and the patients complain of feeling cold. There is often a decided loss of weight. These symptoms may be spread over a shorter or longer period, even extending to years, and vary in severity.

On examination there is usually tenderness over the gall-bladder area and epigastrium, the gall-bladder may indeed be palpable as a smooth rounded mobile tumour dependent on the existence of a mucocele and the plugging of the cystic duct. Unfortunately an X-ray examination may not elicit a positive diagnosis, nevertheless this method of diagnosis should never be neglected.

With the advent of definite biliary colic the condition now takes on a much more definite character and does not present the difficulties of diagnosis met with in the initial stages of cholelithiasis and cholecystitis. The attacks of biliary colic are sometimes almost of a periodical character, and the jaundice transient in nature, owing to the ball-valve action of the stone and its sequelæ, *viz*, rise in temperature, pigmentation, itching of the skin often of an intense nature, and the character of the fæces and urine are diagnostic, and in this stage very little difficulty is experienced in making a diagnosis. In the case of chronic jaundice, however, other questions arise, complete impaction of the common bile duct by stone, impaction of the cystic duct pressing on the hepatic ducts, impaction of all ducts by stones, malignant disease of the lower end of the bile ducts, secondary to stone or spreading from the neighbouring organs, *viz*, malignant disease of the head of the pancreas, or even chronic local pancreatitis. These latter conditions give rise to persistent and deepening jaundice, however, and not to the typical jaundice associated with gall-stone colic. Mayo states that 50 per cent of cases of jaundice are associated with gall-stones, 20 per cent are of a simple catarrhal type, 15 per cent associated with malignant disease—half of which latter are due to malignant disease of the liver, and half to malignant disease of the gall-bladder, biliary passages, or pancreas, and 15 per cent to acute infective conditions (empyema, suppuration, etc.) or the jaundice associated with cirrhosis. In connection with this Courvoisier's law should be remembered, if there is dilatation of the gall-bladder with mucus, 90 per cent of these cases are due to malignant disease. In 80 per cent of cases where the gall-bladder is found to be shrunk or contracted, the cause is due to gall-stones. In giving an outline of the symptoms it has been shown that a percentage of these may be of a very trivial character, and may never create sufficient discomfort for complaint, and indeed it is estimated that they are found in 20 per cent of all post-mortem examinations. On the contrary however their potentialities for damage

are very considerable and may be of a disastrous character. Ulceration after adhesions into the large (or small) intestine may solve one difficulty, but is prone to create another, that of a super-added infection. Ulceration into the general peritoneal cavity with all the symptoms of general peritonitis and an abdominal catastrophe the formation of a subphrenic abscess with its dangers of peritonitis or empyema and lung infection may ensue. Suppurative conditions in the liver, suppurative cholangitis or a pyelephlebitis with pyæmia, and consecutive suppurative hepatitis and finally malignant disease of the gall-bladder or biliary passages following on the continued irritation set up by the pressure of a gall-stone, are possible end results.

In this brief survey the functions of the gall-bladder have been purposely omitted. Its utility as a healthy functioning organ is obvious but once it passes into the stage of chronic infection the question of its treatment and removal has practically passed the stage of controversy,—providing, of course, that the patency of the common bile duct is assured.

OBSTETRIC IMPRESSIONS

By DR J M DASS, L.M.S.,

*Teacher of Midwifery, Campbell Medical School and
late Resident Surgeon, Eden Hospital,
Calcutta*

(A paper read at the Calcutta Medical Club)

1 *Cæsarean Section*—I would ask my learned colleagues who have been engaged in obstetric practice for many years, or those young and rising friends who have had occasion to call in specialists to manage cases of difficult labour, to call to mind cases in which they have experienced or seen great difficulties in delivering children. For high forceps and tug-of-war, craniotomy, sepsis, prolonged illness, convalescence and sometimes death are not of uncommon occurrence. Moreover a certain percentage of these cases become absolutely sterile after such childbirth owing to salpingitis, cellulitis, para- and peri-metritis.

I am certain that in common with myself they will recollect cases in which the results to mother and child would have been infinitely better if, instead of delivering the child with difficulty via the maternal passages, they had boldly selected the operation of Cæsarean section. Many here, for example, will recall primigravidae with relatively rigid and narrow vaginae in whom the cervix dilated slowly, the presentation was often an occipito-posterior, where finally, delivery was effected with great difficulty and considerable injury to both mother and child, possibly even with death of mother or child or both.

I am here this evening not to discuss the pelvic and non-pelvic indications or technique of Cæsarean section as I consider myself only a recruit with 17 sections since 1914 (one death). For there are master men such as Munro, Kerr, Eden,

Kelly, Holland and Newell whose books and memoranda give us ample information. But from my own experience there are two points I would like to lay stress on—(1) Cæsarean section is an operation which is having an ever widening application in the complications of pregnancy, and should and undoubtedly before long will replace many of the complicated and risky manipulations at present practised. Our present accepted indications are, I believe, contracted pelvis of high grade where an absolute indication is present and also numerous obstructions to parturition. These are practically the only absolute indications for section, whereas with the progress of art the gradual acceptance of Cæsarean section as a method of treatment is at present coming into use for eclampsia, placenta prævia, persistent occipito-posterior presentation, rigid cervix and vagina, advanced pulmonary tuberculosis, etc. The results of Cæsarean section are not ideal, but the statistics published by men of unquestionable operative ability and of good obstetric judgment show that the operation is attended by a mortality of 2 to 4 per cent in all types of patients who are subjected to operation.

(2) The second point is that the results obtained by Cæsarean section performed at the time of election (*i.e.*, before labour begins or early in labour) are very much better than the results of the secondary or late operations. Hence it is evident that every patient should be carefully studied during the last month of pregnancy in order that no indication which may properly call for Cæsarean section may be overlooked so that if the operation seems indicated it may be performed at the time when the best results may be expected for both patient and child.

In general practice this precaution is usually overlooked with the result that the majority of Cæsarean sections are performed at a time when the dangers of the operation have been much increased either by prolonged labour, by repeated vaginal examinations, often conducted under doubtful asepsis, or by ineffectual attempts at pelvic delivery.

On the other hand a routine Cæsarean section in all late cases of complicated labour will probably prove more fatal to the mother than the routine adoption of any other method. Many lives are sacrificed yearly because Cæsarean section is widely adopted as the easiest way of meeting a complicated situation without regard to the fact that the prognosis of the operation grows steadily worse with every hour of actual labour to which the patient is subjected, and that every vaginal examination also increases the risk, even though the asepsis is beyond reproach.

It may be urged that the general practitioner is not qualified to determine the necessity of an elective operation—a fact which is undoubtedly true in most cases, since he has not been afforded the opportunity of acquiring the special knowledge on which such a decision must be based—but that is no excuse, since it would ordinarily

be a simple matter for him to refer every primipara, and every multipara whose previous obstetric history is questionable, to a well trained obstetrician for an opinion as to the proper method of delivery in a given case.

The study of each individual patient and the adoption of the method of delivery best suited to her needs will do much to improve the results. So long as general practitioners are not interested in obstetrics, specialists worthy of the name cannot widen their views and improve their technique, and until midwives are well taught and are all diplomæd and registered the results will never be satisfactory and many mothers and children will be sacrificed unnecessarily.

Until the medical profession realises the importance of *prenatal care* and is willing to admit that no man or woman can do intelligent obstetrics unless he or she has a special training to fit him or her for the work, the results will continue to fall short of what they should be.

Cases where Cæsarean section would have given a live child and short convalescence—

(1) Mrs W, age 26, a young healthy primipara—measurements external—typical, normal, interspinous $10\frac{1}{2}$ in., intercrystal $11\frac{1}{2}$ in., external conjugate 8 in., was under my observation for the last 5 months of her pregnancy and went to full term with normal engagement of head. Started labour in the usual way. Uterine inertia was noted from the very beginning. After 36 hours of slow labour, the os was found three fingers open and dilatable. I ruptured the membrane but there was no advance. Before applying forceps I examined. The head was in the pelvis, lying occipito-posterior, and manual rotation was impossible. Forceps extraction with Walcher's position failed. After repeated attempts I had to perform craniotomy. In fact to get a live child the force required would have been tremendous and unjustifiable. Laceration of the perineum was complete. The patient had a long convalescence and was unable to pass urine for 14 days. There was no fever. At present the patient is doing well (child weighed $10\frac{1}{2}$ lbs).

(2) Mrs D., age 27, primipara—short stature—external measurements—interspinous $10\frac{1}{2}$ in., inter-crystal $10\frac{1}{2}$ in., external conjugate $7\frac{1}{2}$ in., internal measurements were not taken early as no pelvic contraction was suspected. She went to full term but the head did not engage in the pelvic cavity during the last six weeks. Internal measurements were taken but the sacral promontory could not be reached easily, hence the diagonal conjugate was thought to be sufficient to allow the head to engage when the patient came into labour. Labour commenced but after 24 hours of good pains and strong contractions with the os fully dilated and the membranes ruptured, the head of the child still floated above the brim. High forceps was out of the question. Version was performed and with great difficulty the child was extracted, as the uterus was rather firmly contracted. The result was a still-born child of $9\frac{1}{2}$ lbs. In addition there was complete laceration of the perineum. With a month's convalescence the patient made an uneventful recovery. The perineum healed by first intention.

(3) In 1917 a patient, a Bengalee of respectable class was brought to the Eden Hospital by a doctor. The history of the patient was that she was lame owing to tuberculous hip. When she was pregnant the doctor in charge thought she would deliver herself naturally, as similar cases very often do. She came into labour and after 42 hours of labour was brought to the Eden Hospital with an appeal for Cæsarean section as the child was alive. When I saw her the temperature was

103 degree F, pulse 120, offensive vaginal discharge, child living I asked the visiting surgeon to see her and section was not advised as the patient showed signs of septic infection I had to perform high craniotomy and the body of the child had to be extracted by cleidotomy Patient got well and left hospital I hear that in 1918 she was again admitted at full term to the Eden Hospital and at the elected time Cæsarean section was done Mother and child living

(4) Mrs G, 1920 February, age 25,—primipara A stout patient with pendulous abdomen External measurements normal Internal measurements —Diagonal conjugate $4\frac{1}{2}$ in by Skutche's pelvimeter She started labour which was allowed to go on for 20 hours The head did not engage I explained the position and the dangers attendant and gave her the option of Cæsarean section which afforded a 90 per cent chance for the baby's life and an equal chance for her own I was confident of my prognosis as the case was directly under my own observation Some 10 per cent risk for the mother was worth while taking I operated Both mother and child did well

(5) About two months ago I performed Cæsarean section on a certain Mrs H, age 20, a cripple from the age of nine Her pelvis was well formed Her crippled state was due to bone disease for which repeated and extensive operations had been done at the Presidency General Hospital on her right leg She married about 2 years ago I was entrusted with the case I measured and found the external measurements quite satisfactory but there was slight tilting of the pelvis

It was a border-line case and another specialist who was consulted agreed with me that as she was not a cripple from infancy the probability was that she would deliver herself naturally

At full term she started labour pains naturally I kept her under observation and took all aseptic precautions before making any p.v. examination The os became fully dilated, the membranes ruptured, but there was no advance This patient prayed us to have a live child So the risk of high forceps and craniotomy etc., were not taken and Cæsarean section was done by me and I am glad to say that the patient had her first motor drive on the 17th day after operation taking her baby with her, a lusty girl weighing $9\frac{1}{2}$ lbs

II Ectopic Gestation

Now, Mr President and Gentlemen, I will cite two cases of tubal rupture, one of which was an object lesson to me

1 In November 1920, I was called at 11 p.m. to see a lady at her residence, a few miles from Calcutta There was a big feast and after dinner the lady commenced vomiting with crampy, paroxysmal pain over the abdomen When I reached the place I found her vomiting acid-smelling food stuff She complained of colicky pain over the abdomen The temperature was normal, the pulse slightly quicker than normal There was no distension of the abdomen The patient was somewhat restless I enquired casually about her menstruation and she said that it was irregular in time and that that very morning she had noticed a few spots I did not attach any importance to this fact I advised her husband to take her down to Calcutta as proper medical help at that place was out of the question She was practically carried to the car as she could not stand on her feet I knew the patient to be nervous and very neurotic so I did not attach much importance to her helpless condition I was with her for some time in her Calcutta residence thinking all the while her case to be one of gastritis, with colicky pain due to the luxurious feasting After an hour or so I came home, but was soon called by the husband who sent his car saying that the patient was very bad and I was wanted urgently I sent the car away with a prescription of a sedative mixture and followed immediately in my own car and found quite a different picture The patient was restless, with severe thirst, the extremities cold, the pulse very fast I rearranged her whole case in my mind and made a p.v.

examination Nothing definite was found, only tenderness and a little blood smear

From her fast sinking condition I thought it to be a case of ectopic gestation. I took her down to the hospital and at 7 a.m. operation was performed Her pelvis and part of the lower part of the abdomen were full of liquid blood with blood clots It was a rupture of the interstitial portion of the right tube. The patient made an uneventful recovery

2 In 1915 a young multipara was brought to the Eden Hospital out-patients She was absolutely blanched with a history of intestinal obstruction It was a case of acute abdomen treated outside for 12 days with enemas, long tube, etc. I performed laparotomy and intravenous saline injection was started with the operation A bucket full of blood welled out from the peritoneal cavity The patient died a few minutes after operation It was a case of tubal rupture of the right side

3 A few days ago Rai Bahadur Dr Lalbehari Ganguly sent me a specimen of tubal rupture with the foetus from a post-mortem on a woman She was supposed to have taken *bhang* when out with some men in a taxi She came home and vomited and was treated accordingly She died at her place next morning The body was sent by the Police for suspected poisoning

I have seen and operated on a good number of late and early ruptures of tubal gestation and a good few selected cases were treated by rest and a certain percentage by posterior colpotomy and drainage From this experience I find that the family doctor is so unfamiliar with the symptoms that neglected cases are the rule in extra-uterine pregnancy rather than the exception Hence the obstetrician should make the profession at large more familiar with ectopic gestation and with a different conception of symptomatology and diagnosis than that which they usually obtain from the text-books

My series of cases impresses the following points on my mind —

(i) The relative frequency of ectopic pregnancy

(ii) There is almost always vaginal blood discharge when there has been intra-abdominal hæmorrhage hence many cases are mistaken for cases of threatened abortion or of incomplete abortion

(iii) The third impression naturally follows that every patient presenting suspicious symptoms of threatened, imminent or incomplete abortion, should be examined with the possibility in mind that she may be a case of ectopic pregnancy, more especially if the cramps are located in the side of the pelvis

(iv) If any woman of child-bearing age is seized with abdominal pain of severity followed by shock or syncope or acute abdomen, even if transient, she must be regarded as a possible case of ectopic pregnancy until proved otherwise

(v) The obscurity of the clinical history in the early stages is especially due to the fact that amenorrhœa fails to be a symptom of ectopic pregnancy

(vi) Diagnosis before rupture is very rarely to be expected

(vii) Cases in which there is reason to think that hæmorrhage is still going on should be promptly treated by abdominal section

❧ (viii) Expectancy does not yield the best results in cases in which there is large hæmatocele or one that remains unabsorbed for a long time. Posterior colpotomy and drainage mean less strenuous measures and more satisfactory results in some cases.

(11) The presence of jaundice is a useful diagnostic aid in distinguishing tubal pregnancy from tubal inflammation and should not escape attention in doubtful cases.

(1) A leucocyte count is very useful in a few late cases where the diagnosis lies between blood and an inflammatory exudate.

III Post-Partum Hæmorrhage

Post-partum hæmorrhage is of common occurrence, and I dare say that every one of us present here must have met with cases where the standard treatment gives us most satisfactory results.

All of us know that post-partum hæmorrhage has practically three causes—

- (1) Laceration of the parturient canal
- (2) Retention of the placenta (partial or complete)
- (3) Inadequate shrinkage of the uterus

The first factor is easily remedied by repair and pressure.

The third factor calls on our resources to tone up the uterine wall, *e.g.*, *Mechanical*—Uterine massage, bimanual compression, plugging, etc. *Thermal*—Hot douches. *Chemical*—Administration of ergot, infundin, ernutin, etc. These are standard treatments and need no comment from me.

What I want to impress on you is the second factor "partial or complete retention of the placenta." We were taught in our college days to examine the placenta and its membranes very carefully after normal or artificial expulsion of the placenta, and if we are satisfied and pass it entire there should be no anxiety from this factor and we must look to atony of the uterus for the hæmorrhage.

I may now mention two of my cases where every possible care was taken to examine the placenta which were passed entire, and the atonic condition of the uterus was treated by every possible means, yet severe post-partum hæmorrhage continued till blunt curettage stopped the hæmorrhage and the patient survived.

(1) In 1919 I had a 7-pregnancy to deal with. The child was born without any complications. The placenta with the membranes was expelled and examined carefully and passed as entire. Severe post-partum hæmorrhage followed. Uterine massage bimanual compression hot intrauterine douches infundin injection, ergot by the mouth were given and the collapse was treated by saline. The extremities were bandaged, etc., but still the bleeding could not be checked. As a last resource I explored the uterus and felt the decidua to be unusually thick and spongy. I immediately curetted the uterus with a blunt flushing curettage and thick decidua tissue came away. The bleeding stopped and recovery was uninterrupted.

(2) In November 1921 I had a puzzling case of post-partum hæmorrhage. The patient was a 3-para. Her second confinement was under my supervision when

she had slight post-partum hæmorrhage and ordinary routine treatment stopped the hæmorrhage. This was her 3rd delivery and I kept everything ready to meet any emergency. I might mention that she had an enlarged spleen with a history of chronic malaria and as a suspected case of kala-azar was treated at the Presidency General Hospital for months with antimony without any effect. Her confinement till the birth of the child was uneventful. Twenty minutes after the birth of the child the placenta was expelled and then followed severe post-partum hæmorrhage. The placenta was examined three times before, during and after the hæmorrhage. It was entire. She had everything done possible to stop the hæmorrhage and last of all an injection of hæmostatic serum (Parke Davis & Co), and eventually the hæmorrhage was stopped.

From the third day she had a rise of temperature for a week or ten days like a slow sapræmic temperature ranging up to 100 degrees F. The discharge was fresh and sweet. I treated her in the same way as any other septic puerperal condition with no effect. On vaginal examination on the 10th day, the uterus was found not extra bulky. The lochia were not offensive. Blood examination showed no malarial parasites and no leucocytosis. I changed the treatment as her spleen became painful. I started giving her quinine injections, arsenic, etc. and horse serum injections for her general hæmophilic condition. Still her temperature lagged on between 98 degrees F and 99.4 degrees F. She was allowed out of bed, when, on the 25th day of her confinement, I was suddenly summoned and the patient had a severe secondary post-partum hæmorrhage. I was single handed and had to remove her immediately to the Campbell Hospital in an ambulance and curetted her, removing lumps of thick leathery-like decidua tissue and plugged the uterus. The patient made a very quiet recovery. The temperature became subnormal from the third day after curettage and remained normal for a fortnight, when she left Calcutta.

(3) In this connection I remember a case about a year ago, an Indian Christian, Mrs M., whose last child was 2 years before. She had amenorrhœa for 5 months and bleeding off and on. I examined and told her she had a retroverted uterus and suspected pregnancy of 2½ months' duration, and that it was a case of threatened abortion. I lost sight of the case. A few months later I was sent for with a history that the patient was having premature labour and hæmorrhage. When I arrived I found a diplomæd midwife of some years' experience sitting between her legs expecting the child to be born. She told me that the membranes had ruptured and the child's heart sounds were good and asked me to treat her for placenta prævia.

I palpated, but I could not find an enlarged uterus of 8 months' pregnancy as I was told, but merely a tympanic abdomen. I made a vaginal examination and found a uterus the size of a 2½ months' pregnancy and retroverted, but this time the os was found open. I told her husband that it was an inevitable or incomplete abortion of about 2½ months. The husband was rather annoyed with me and said "Some months ago you diagnosed the case to be one of threatened abortion of 2½ months' duration. We called in another specialist who said that the patient was pregnant to that extent. The patient has not menstruated since, i.e. 4½ months, therefore the patient is 7 months pregnant as the patient herself thinks she is."

Anyhow I explored the uterus as the bleeding was pretty severe. I found inside the uterus an irregular piece of organised placenta-like tissue the size of half a hand, studded with numerous small and large cysts varying from a pin's head to a pea containing clear fluid. Since the curettage her periods have become regular.

IV Eclampsia

All are agreed that eclampsia is to a very large extent a preventible disease. Hence the prime importance of ante-natal care.

From 1914 to 1918 at the Eden Hospital while I was acting resident surgeon, a unique opportunity for me, I had full scope for treating eclamptic cases in my own way with valued suggestions ungrudgingly given by Colonel C R M Green, my former chief, to whom I am deeply indebted for his kind permission to publish the result of my cases conducted at the Eden Hospital

I drew up a chart in the Labour Room for the nurses and House Staff's guidance. A similar chart in rather more detailed and elaborate form I have drawn up for the Campbell Hospital students and my Resident Staff

Statistics of Eclampsia cases at the Eden Hospital —

Year.	Total Number of Labour Cases	Total Number of Eclampsia	Cured	Deaths	Percentage of deaths
1910	945	8	4	4	50
1911	1,060	7	0	7	100
1912	994	9	3	6	60
1913	1,055	10	6	4	40
1914	1,055	14	12	2	14
1915	1,100	9	8	1	11
1916	1,214	16	15	1	6
1917	1,219	14	12	2	14
1918	1,216	18	11	7	38.5
1919	1,121	33	14	19	57.5
1920	1,101	32	12	20	64

CHART FOR THE STUDENTS, HOUSE STAFF AND LADY DOCTORS

Eclampsia is almost entirely a preventible disease, for the premonitory signs are plain to any one who takes the trouble to watch for them

Prevention —

(1) Whenever it is possible a case of pregnancy should be seen and examined at least once a month during the first seven months and twice a month during the last two months. The blood-pressure should be taken, if possible

(2) Do not fail to examine the urine at least twice a month during the last three months and if albumen or casts are found, put the patient on to milk, vegetables and water only for forty-eight hours or more and then gradually resort to albumen water, whey and then dilute milk and water till all trace of albumen disappears. Sometimes starvation is useful. Give sodium bicarb, diuretics, saline purgatives. Rest in bed if necessary

(3) Look out for such symptoms as headache, gastric pain, scanty micturition, disturbances of vision and treat accordingly by milk diet, free purgation, copious drinks of plain water and alkaline draughts by mouth or rectum

TREATMENT OF A CASE OF ECLAMPSIA

Each case of eclampsia should be treated on its own merits. No one form of treatment can be uniformly successful. Do not look upon eclampsia as a one-man

case. There must be a sufficient number of trained helpers and nurses if every case is to be saved. If the proper conditions cannot be obtained at home it is better to send her to a good hospital or a nursing home.

The following articles may be wanted to treat a case of eclampsia —

- (1) Surgical or improvised mouth gag
- (2) Mask for ether or chloroform
- (3) Stomach wash tube
- (4) Rectal long enema tube
- (5) Rectal saline apparatus
- (6) Subcutaneous or intravenous saline apparatus
- (7) Blood-pressure apparatus
- (8) Dry-cupping apparatus
- (9) Dressing, gauze and bandage
- (10) Urinary catheter—glass or rubber
- (11) Test tubes, etc., for examination of urine
- (12) Morphia tablets or Hypoloids (gr $\frac{1}{4}$)
- (13) Veratrine 1 cc ampoules or Tr Veratrum Viridi.
- (14) Ether
- (15) Chloroform
- (16) Soda bicarb solution (dr 1 to oz 1), 8 pints for stomach or rectal wash
- (17) Sterile soda bicarb solution in normal saline (dr 1 of soda bicarb to oz 1 of normal saline) oz 11
- (18) Sterile saline solution, oz 11
- (19) Liquid glucose 4 oz
- (20) Saturated solution of magnesium sulphate (dr 11 to oz 1)—oz viii
- (21) Stock mixture of sodium bromide and chloral hydrate (dr $\frac{1}{2}$ of each to oz 1)
- (22) Calomel powders—(gr v each)
- (23) Croton oil—m iii in capsules

(a) *Mild cases*—When patient is conscious, can swallow freely, and convulsive fits are of short duration ($\frac{1}{4}$ to $\frac{1}{2}$ minute) or at long intervals

(1) Absolute rest in bed with side rails or protected by pillows or on the floor upon a soft bed

(2) Dark, cool room, avoiding bright light and noise

(3) Clothes should be loose, avoiding any irritation

(4) During active convulsions patient is put on her side, gag in her mouth to prevent biting her tongue

(5) A few whiffs of ether, if available, otherwise chloroform whilst getting the morphia injection ready

(6) The initial dose of morphia hydrochlor or sulphate is gr $\frac{1}{4}$ to gr $\frac{1}{2}$ to control fits. It can be pushed to gr $\frac{3}{4}$ to gr 1, but not indiscriminately, especially when there is cedema of lungs and high blood-pressure. In such cases blood-letting (phlebotomy) is the only salvation

(7) In the interval between convulsions take the blood pressure and examine the urine. If the blood-pressure is moderately high, say 150 to 175 mm, inject veratone 1 cc, repeated every two hours till the blood-pressure comes below 150. Tr Veratrum Viridi may be given by mouth.

(8) Croton oil, calomel, saturated solution of magnesium sulphate oz 11, stock mixture of potassium bromide and chloral hydrate mixture and diuretic mixture with or without agurin are given by mouth

(9) Give a high tube enema and then colonic irrigation with soda bicarb solution and retention of a pint or two of 5 per cent solution of glucose in soda bicarb solution. If the stools are very hard saturated solution of magnesium sulphate, oz 4 per rectum

(10) If the patient is not in labour do not interfere. If labour progressing rapidly do not interfere

If tardy labour and os not fully dilated, rupture the membrane and apply forceps if head is presenting and os fully dilated or can be fully dilated manually

If breech rapid extraction. If child is dead craniotomy

(b) *Moderate cases*—When convulsive fits are frequent and of short duration and patient is semiconscious

1 For the first few hours—conservative, sedative, and depletive treatment. *Vide* treatment for mild cases with, in addition—

(a) Gastric lavage for the removal of fermenting food and oral administration of medicines

(b) Sweating by hot packs and electric cradle

(c) Rectal lavage, drop instillation of sodu bicarb and glucose

(c) *Severe cases*—When convulsive fits are very frequent the blood pressure is high, 175 mm upwards, cyanosis, embarrassment of respiration and conservative treatment fails to improve

(1) Venesection—12 ozs or more of blood is let from the median basilic vein and a pint of sterile sodu bicarb, solution (dr 1 to oz. 1) in normal saline introduced

N.B. Venesection is absolutely contraindicated if the blood pressure is below 150 as it causes severe cardiac depression, shock and anæmia

(2) Subcutaneous saline with sodu bicarb

(3) Digitalin and veratone injection discriminately

(4) As regards labour A primigravida developing frequent severe fits before labour with os closed, child alive, cervix not taken up and patient passing no urine Cæsarean section is strongly advocated and is undoubtedly better than forcible extraction through the imperfectly dilated cervix. Increasing Western experience shows on the strength of considerable numbers of Cæsarean sections that it is the safest easiest and most satisfactory treatment Of course when the ideal conditions are not at hand then medical measures with rupture of the membranes, hydrostatic dilators, bipolar podalic version are advocated But the mortality of such is appalling, 44 per cent for mother and 98 per cent for child

VITREOUS ESCAPE IN INTRACAPSULAR EXTRACTION OF CATARACT IN PROMINENT EYE-BALLS OR FAT PATIENTS

By DR. HARI SHANKER, R.B., L.M.S.

Muthra, U P

If both fornices are exposed to view when looking from the side, the assistant has efficiently managed the lids and the eyebrow and vitreous should not escape This is the test The surgeon should satisfy himself in this respect before opening the eye-ball

Exposure of the fornices is easy when the globe is shrunken and in patients of slender constitution It is sometimes impossible with prominent eye-balls and in fat people In the latter case the following step requires to be taken to avoid vitreous escape

1 Let the assistant manage the lids and the eyebrow

2 Make a preliminary conjunctival flap if you make one

3 Take a small pledget of cotton wool Place this whilst wet upon the exposed eye-ball

4 Place your thumb, index finger and the middle finger on the cotton wool pledget erect upon the eye-ball The tips only should rest on the sclerotic and not on the cornea

5 Gently press the eye-ball backwards, steadily increasing the pressure, whilst you mentally count two hundred

6 The patient should not complain of pain If he does, reduce the pressure a little

7 Remove the pledget and you will find,

(a) the cornea somewhat steamy, (b) any bleeding from the conjunctival flap stopped, (c) the secretion of tears stopped Any danger of infection is reduced, as the eye-ball is dry, (d) troublesome patients who constantly roll their eye-ball upwards begin to behave better Irritability is reduced, (e) the danger of expulsive hæmorrhage is diminished when the tension is plus, (f) careless pressure on the cornea erodes the epidermis, (g) when expressing the lens with the hook, the cornea is found to be dipping in easily The tension being reduced, the feeling is that of pressing on to something softer than one is accustomed to do, and (h) *vis a tergo* of vitreous is absent or is reduced considerably

After giving this method a fair trial I brought it to the notice of the Profession in a paper read before the All-India Medical Conference at Delhi in 1918 Since then I have practised it without the least harmful results

GONORRHOEA OF THE FEMALE GENITAL ORGANS AND ITS MANAGEMENT

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In a paper on pelvic infections read before the Chicago Gynæcological Society, I classified such infections as descending and ascending The descending infections are caused by continuity of organs, by blood and lymph infection of tissue The ascending infections are from without, *per vias naturales*, 99 per cent of the ascending type are either puerperal or gonorrhœal

For convenience of description, gonorrhœa of the female generative organs is usually divided into external and internal invasion The external infection extends to the internal os, involving the glands of Bartholin, Skene's glands in the urethra, the racemose glands of the cervix and the interlying mucous membrane with its countless glands Internal infection comprises the female organs above the internal os the uterine cavity, the tubes, the ovaries and the pelvic peritoneum

In order better to understand the *modus operandi* of the gonococcus as also the methods of ridding the tissues of this micro-organism let us examine some of its characteristics The gonococcus differs from other microbes in many respects It is most easily affected and killed by heat or cold It is heat-sensitive both *in vitro* and *in vivo* An optimum temperature for it is 97° to 98° F Any appreciable increase in temperature has a very deleterious effect on the life and growth of the organism A sudden rise to 102° means certain death to

the culture The culture medium must be of a special kind, of proper reaction, great care being needed that the medium is not chilled on inoculation Desiccation is highly deleterious to the organism Mixed inoculation of the culture medium easily overwhelms and kills the gonococcus, the growth of which, at best, is very scanty It is readily destroyed by very mild antiseptics

With all these non-resistant properties, why is it that gonorrhœa of the female genital tract is so intractable, and once above the internal os, why is it, as a rule, beyond one's therapeutic reach to prevent tubal infection with its concomitant sterility or one-child marriages?

To understand this we have first to study the tissues of the female genital tract involved in gonorrhœal invasion, secondly the mode of invasion and extension of the organism

The glands of Bartholin, *glandulæ libidinis*, are situated at the introitus vaginæ posteriorly in the lower portion of the labia majora, partly or wholly covered by the sphincter vaginæ muscle Their size varies from that of a small bean to a large bean, according to the age and sexual life of the patient The duct is about $1\frac{1}{2}$ centimetres in length and runs upward and inward There may be duct infection alone or duct and gland infection These glands are the most frequent harboring places for the gonococcus, and failure to recognise this may be the cause of continued unsuccessful treatment of husband or wife alone, a reciprocal infection, albeit of mild degree, may be kept up indefinitely Normally the gland cannot be felt excepting, perhaps, in greatly emaciated women In a Bartholinitis of long standing, with sclerosis, we have the so-called "*adenitis glandulæ Bartholini sclerotica*" of Saenger, in which case the gland is readily palpable In ordinary infections the tenderness on pressure with escape of a drop of pus, and the macula, will readily establish the diagnosis

Infection of the female urethra, more so than in the male, is a self-limited disease, if Skene's tubules are involved, however, the condition may persist indefinitely Skene's tubules, two in number, on the floor of the urethra, extend from the mouth of the tubules, opening just internal to the external meatus about one centimetre back parallel to the urethra Schueller has called attention to the fact that, occasionally there are supernumerary glands This should be borne in mind in intractable cases Pain, tenderness and discharge are the symptoms of infection

Deeper-seated and more complicated is the infection of the cervical glands These glands are of the racemose type and branches of the *arbores vitæ* often extend deeply into the myometrium A deep-seated infection of this type causes turgescence of the cervix and the crypts

and folds in the cervical canal are filled with the characteristic thick, white, tenacious mucus so well known by the term leucorrhœa It goes without saying that this leucorrhœal discharge may be as infectious as the gonorrhœal pus This plugging up of the cervix enhances the possibility of the infection invading the region above the internal os Although the internal os, as a rule, is a natural barrier against any extraneous matter attempting to enter the uterine cavity, there are times when the fibres of the os relax and a suction movement of the corpus uteri facilitates the upward movement of vaginal contents whatever they may be

Compared with other pyogenic organisms, such as the streptococcus and the staphylococcus, the gonococcus has little or no power of penetration It generally develops on mucous membranes and it spreads by extension along the mucosa and the submucosa, and very infrequently extends into the deeper structures Where squamous epithelium exists the changes produced by the organisms are slight as the cellular elements are too resistant to its growth But in the true mucosa the surface epithelium swells, the cells are separated by the inflammatory exudate and soon desquamate, later to be replaced by modified epithelium or cicatricial tissue The organism quickly gains access to the glands, producing desquamation of the epithelium investing the glands, periglandular inflammation, usually destroying the epithelium and its basement membrane with abscess formation In such pus-pockets the germ may persist indefinitely, producing chronic inflammation It may be mentioned in this connection that Bandler and Doederlein believe that the micro-organism present in acute gonorrhœa produces an acute inflammation whilst those present in a chronic case produce chronic inflammation McDonagh holds that an acute case has a short incubation period and *vice versa*

The gonococcus may lie dormant in the genital tract for indefinite periods of time and may become active at any time if there is a congestion of these organs for physiological or pathological reasons, as during pregnancy or miscarriage, excesses of any kind, menstruation and puerperal infections We have probably all heard of the common belief amongst the laity that the menstrual discharges are infectious and cohabitation for that reason, if for none else, should be avoided This, as is easily understood, is due to the recrudescence of any latent disease during the menstrual epoch, following pelvic congestion, as also to the neutralization of the normally acid vaginal secretion

The predilection of the gonococcus for columnar epithelium is the cause of the great frequency of cervical complications Approximately 80 per cent of the acute and 95 per

ment of the chronic cases are affected with endocervicitis. Occasionally we find an engorgement of the portio vaginalis covered with squamous epithelium resulting in retention cysts, ovula Nabothi. Much could be said about the microscopical changes in the cervix during this inflammation, suffice it to say that metaplasia of the cervical epithelium is almost the rule. Microscopically the swelling and hyperæmia of the cervical mucosa is so great that it protrudes from the external os. Endocervicitis has a tendency to become chronic, whereas an endometrial involvement tends to resolve. An endometritis may be kept up by re-infection from the tubes. With an invasion of the endometrium the tubes are invaded apparently simultaneously. Spread of the infection from endometrium to tubes is favoured by anatomical conditions. Whereas the myometrium is involved occasionally, only producing a degenerative process, it is in the tubes in almost every case that the principal and lasting havoc is wrought. Salpingitis, pyosalpinx, hydrosalpinx, tubo-ovarian abscess, pelvic peritonitis and adhesions are produced.

Gonorrhœal lesions of the Fallopian tubes possess certain characteristics that are pronounced enough in the majority of cases of pure infection to prove the etiology of the infection. The gonococcus, as already mentioned, invades the tubes by continuity of tissue along the mucosa, whereas pyogenic microbes reach the tubes by the blood and lymph stream of the broad ligament, leaving marks of their invasion in their wake. Inasmuch as the former invites localization of the latter we find countless cases of mixed infection with non-characteristic morbid anatomy.

Treatment—Bearing in mind the heat and germicide-sensitiveness of the gonococcus, one would be led to believe that early and energetic application of either heat or germicides would promptly rid the tissues of the invader. This assumption would be corroborated by a consideration of the efficacy of Crede prophylactic treatment and by the rapidity with which a gonorrhœal conjunctivitis, once established, can be cleared up, albeit in many instances not speedily enough to prevent damage to the cornea.

In my opinion injudicious and frequent douching is a predisposing factor to infections of the female genital organs. We all know that a certain flora has its natural habitat in the vagina, that the *Bacillus vaginalis* normally is constantly found, that it only thrives in an acid medium and is distinctly destructive to pathogenic microbes introduced into the vagina, as has been proven by experiment. Anything altering the acid reaction of the vaginal secretions, as a profuse leucorrhœa coming from the alkaline cervix, frequent connubial relations or regular and frequent

douches will destroy this natural microbicide and thus prepare the way for infection.

The necessity for early treatment is obvious, and our best results are obtained by early, judicious, unhampered management of the case. The difficulty in the treatment of female gonorrhœa mainly lies in three factors. First the cases do not present themselves during the initial stage of the disease, and if they do appear for relief the prescribed line of treatment is not followed. Secondly, the above described anatomy of the female organs is such that self-re-infection of the tissues constantly takes place because the hiding places above referred to are often overlooked. Thirdly, too little treatment, inasmuch as the application as ordinarily made of bactericides is faulty, tends to cause increased irritation and spread of the infection.

In men an acute attack of gonorrhœa is well marked and is evidenced by pain and intensely painful micturition, general malaise and depression. Sexual thoughts are repugnant to the patient, and as a rule he most ardently seeks medical aid, and, as long as the acute stage lasts, religiously carries out the instructions. At this time there is no danger of dissemination. The danger sets in when patients believe themselves cured whilst in fact they are far from it with their scanty gleet discharge.

In women, on the other hand, the initial symptoms are mild with few exceptions, in fact often there is no other symptom than more or less profuse purulent, often mucopurulent, discharge. Many patients may not even know that they are affected with the disease. At this time women are often disseminators. They do not think of seeking medical aid but do everything and anything favouring invasion of the internal organs. If such a woman, usually more or less frivolous, does come to a physician, she does not, as a rule, care to be inconvenienced by the treatment. Often physicians, on account of the false modesty of the patient or through indifference or ignorance, fail to treat the glandular invasions of the genitals and thus not only self-reinfection of the vaginal tissues takes place but reciprocal re-infection of husband and wife may be carried on *ad infinitum*.

Derby and others have shown that the local action of corrosive sublimate and nitrate of silver is materially lessened by the addition of serum. Thus one hurried, scanty application of a germicide may lose its strength through this dilution.

By meddling treatment we understand injudicious douching, intracervical and even intrauterine applications when not indicated. More harm than one would imagine is done in this way.

Granted that the case comes into your hands at the earliest stage of the disease, in my opinion nothing is more beneficial than rest in bed and nothing is more harmful than over-treatment. By rest in bed I mean lying in bed and resting even to the exclusion of arising to answer the calls of nature. At this stage in women more so than in men exercise is apt to cause spread of the disease to the glands and internal organs. It goes without saying that an even more fruitful cause of complications is sex relations. One can hardly believe that it should be necessary to lay stress on this point. Even in spite of my warning, loose women would leave the hospital, go to a public dance, indulge in their illicit practices and come back four or five days later with a salpingitis. Besides rest in bed, external douches of a mild solution of potassium permanganate, careful instillations into the vagina of a 10 per cent solution of argyrol, a moist boric acid pad, light, non-irritating diet, free catharsis, would constitute a conservative and usually successful treatment of an acute gonorrhœa of recent origin.

Unfortunately in many instances the cases do not come under treatment at an early stage of the disease and often not until the entire external tract is infected. At this stage again the two above named factors are productive of invasion of the uterine cavity, namely, meddling treatment, sounding and intrauterine applications and sex relations. Even in non-specific cases often more harm than good is done by intrauterine manipulations. Suffice it to say, that if, after careful, gentle examination of the internal organs, we are convinced of the freedom from infection of the tubes, we should limit our treatment to glands and cervix.

Infection of the glands of Bartholin may be of two types, first infection of the duct as shown by the presence of the gonorrhœal macula without swelling in the region of the gland, secondly infection of the gland tissue with the characteristic enlargement and tenderness. As stated above a normal gland cannot be palpated. As soon, therefore, as the gland is felt, the quickest and most radical treatment is excision. The gland tissues are destroyed as it is, and the sooner one rids the body of such a source of reinfection the quicker the disease is coped with. A preliminary forcible injection of the gland with methylene blue may be made to facilitate removal, but even this may not reach all parts of the gland, and with or without injection, great care should be exercised to remove all gland substance.

Infection of the female urethra is a self-limited disease and intraurethral applications may enhance invasion of Skene's tubules and Schueller's glands. If a urethritis does not clear up promptly an infection of these tubules

on the floor of the urethra may be assumed. The best treatment is splitting these tubules longitudinally through a urethroscope or destroying them with a cautery needle. The only evidence of implication of the urethral glandules is chronic urethral discharge, without much, if any, pain, tenderness or palpable swelling.

The treatment of a gonorrhœally infected cervix would make a long chapter if careful consideration from every angle be given. The treatment varies according to the age of the patient, the possibility of further offspring, the morbid anatomy, whether the infection is associated with lacerations, uterine misplacements and cystocele, the condition of the vaginal orifice, whether treatment, as in a very young and sensitive girl, is difficult and morally, perhaps, unwise. This last factor should not often prevent us from giving aggressive treatment if indicated.

Inasmuch as gonorrhœal endocervicitis has a strong tendency to become chronic, in fact, most cases come under observation when they have reached the subacute or chronic stage, we may first consider the treatment of this type of infection. We find a swollen, hypertrophic, eroded cervix, with many ovula Nabothi, and, as the case may be, lacerations. As a rule in such cases, with patulous cervix, the infection is subacute or chronic and invasion of the internal organs and sterility has supervened. Trachelectomy of Sturm-dorff might be performed, but I usually prefer amputation, being most painstaking in my consideration of the amount of cervical tissue to be amputated. If there is a possibility or desire for further offspring I would make the lowest possible amputation, exercising great care to get sufficient flap from above and below, thus avoiding much scar tissue and contraction of the external os. Such cervixes, as a rule, will not cause trouble at childbirth. Where no further offspring is expected and an intra-abdominal operation is called for, I would make a high amputation and sterilize the patient.

Gonorrhœal endocervicitis in a nulliparous young woman requires most judicious care. It is our duty not only to preserve the patient from chronic invalidism but also to preserve her internal sex organs for reproduction. Extension of the inflammatory process is most prone to take place during menstruation and sexual relations. The latter must be scrupulously avoided and during the menstrual epoch the patient should rest, if at all possible, in bed. For treatment an anæsthetic is usually required.

The external os and the lower cervix are dilated and a strong germicide applied. I recall Saenger's treatment, whose *Privatissima* Clinic I attended in 1896. The stereotype treatment of hundreds of ambulatory cases

was —pink permanganate douche, application of 50 per cent solution of chloride of zinc to the cervix and into the cervix. He would often demonstrate the action of this Escharotic on the mouths of the cervical glands as a diagnostic feature. He also frequently used this powerful germicide intracorporeally. Since then I have used chloride of zinc a great deal, mostly however in 25 per cent solution. To dilate the cervix safely without entering the internal os a solid dilator, with shoulders of right distance from the tip, so that entry into the os internum is impossible, should be used. With proper care, of course, any dilator may be used. Application of a 25 per cent or 50 per cent solution of zinc chloride with an iodoform gauze pack, to be removed after 8 hours, would finish the treatment. After two or three weeks this treatment may have to be repeated. Instead of the ordinary cotton applicator I often employ a long, thin cannula, with numerous side openings, wrapped with cotton and attached to a Pravatz syringe and thus impregnate the applicator with the germicidal agent after introduction. The diluting admixture of mucus to the germicide, reducing its potency, would thus be counteracted.

During the past few years protein therapy and non-specific resistance have been the subject matter of much discussion and writing. Space does not permit going into detail with regard to this most interesting biological topic. Suffice it to say that some competent observers as Finfer, Petersen, Saxl among many others, are very enthusiastic over their results from this therapy, others are not so sanguine as to its usefulness. My experience with non-specific agents is confined to their application in various types of subacute rheumatism. And, taking into consideration the difficulty of following up cases in an Indian country clinic, my results would warrant further trial. The conviction of Wright, that this method is one deserving of the most careful examination, I would share. Gonorrhœa, the world over, is one of the worst scourges mankind is heir to, in this instance womankind, which in, I dare say most instances suffers innocently. Any method of treatment aiming at eliminating mutilating operations should be carefully scrutinized before discarding it as useless.

To Mr K C Paul, of the Madras General Hospital, I am indebted for his co-operation in points relating to pathology and morbid anatomy.

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THE USE OF GERMINATED PULSE AND BEANS IN THE NATURAL DIETARY OF THE BURMESE

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WHEN Miss Harriette Chick and Miss Margaret Hume published their paper on "The Distribution among Foodstuffs of the Substances required for the Prevention of Beriberi and Scurvy," in the Transactions of the Royal Society of Tropical Medicine and Hygiene, 1917, they ascribed to Furst the credit of first advocating the use of germinated pulse as a food for the prevention of deficiency disease.

I have been unable to obtain a copy of Furst's original paper, and do not know, therefore, whether or not he claimed the credit of initiating the use of germinated pulse as a general article of diet, or as a preventive of deficiency disease.

Until quite recently I had never come across the use of germinated pulse as a natural foodstuff, and I was surprised therefore to find it exposed for sale in the bazaar at Insein, a township about ten miles from Rangoon.

Further enquiries quickly revealed the fact that germinated pulse is on sale in the vegetable markets of Rangoon and throughout Burma, and is in general use as an article of diet.

I propose to state what I have been able to ascertain about the common use of this foodstuff, and to describe the methods used to bring about germination and to prepare the food for consumption.

Germinated pulse is widely used by the Burmese as a food. It is sold in all vegetable markets and prepared by the housewife in most private houses, and is consumed by all classes of Burmese. It is an inexpensive food and is therefore readily procurable by the poor.

Various pulses are in use in different parts of the country and, practically speaking, any of the dals, beans, or peas may be prepared in this way, but certain species are considered better than others and are used for preference. These species are —

PULSES

- 1 *Phaseolus mungo*, variety *radiatus* (Linn)
 This is known in Burma as *Pè-di*, *Pè-di-sein*, or *Pè-nauk*, and is the ordinary green *Mung Dal* of India. It is one of the pulses most widely used throughout Burma for germination, and is the variety most highly appreciated.

2 *Phaseolus mungo*, proper (Linn) This is the common black *Urad Dal* of India. It is cheaper than *Mung Dal*, and for that reason is perhaps more extensively used among the poorer classes and sold to them in the bazaars. Its Burmese name is *Mat-pè*.

3 *Phaseolus calcaratus* (Roxb) This pulse, known in Burma as *Pè-yin*, is not so widely used for germination as either of the preceding varieties. It is, however, not infrequently employed and is cheaper than *Mung*. It is known in parts of India as *Bora*.

BEANS

1 *Dolichos lablab* (Linn) variety *lignosus*, (Pram) This bean, which is highly esteemed as a garden crop throughout Burma, is often germinated and then lightly boiled. It is white in colour and is sometimes erroneously called the Rangoon white bean. The Burmese name is *Pè-gyi*.

2 *Phaseolus lunatus* (Linn) This is the *Lima* or *Duffin Bean*. The varieties of it, known as the Rangoon red bean and the Rangoon white bean, are much used for germination. Rangoon red bean is called *Pè-gya* in Burmese, and the white variety is known as *Pè-byu-gale*, and the favourite method of preparing both is first to sprout the seed and then lightly boil or fry it.

Methods of Germination—The pulse or bean is first washed, then fully immersed in water, and allowed to soak for a time varying from twelve to twenty-four hours. Usually it is put into jars or bowls in the afternoon or evening and taken out the following morning. It may then be treated in several ways.

1 Placed in baskets, through the openings of which excess water drains off, and covered with a layer of cloth. A shoot appears on the second day and germination is allowed to continue for two or three days, according to the kind of pulse used and the size of shoot desired.

2 Put into porous pots, covered with cloth and allowed to germinate as in 1.

3 Spread in a thin layer on a mat, and covered with a wet blanket or cloth which is kept damp.

4 Sprinkled on the surface of a bed of prepared earth or sand, which is kept wet by frequent watering.

In each case germination is stopped when the young shoots are sufficiently developed. The Burman likes the radicle to be from an inch to an inch and a half long, and the green leaves of the plumule to be visible projecting from between the cotyledons. The shoots are then thoroughly washed to free them from the husks, and prepared for the table.

Preparation for the Table—The shoots may be eaten cooked or uncooked, and are prepared in a number of ways.

Uncooked—*Pickled* *Pè-di* or *Mung Dal* is always used. The shoots after having been prepared by one or other of the methods described, are placed in a jar containing a solution of common salt, and allowed to soak for four to six days

in either plain or rice water. By this time the shoots have shrunk in size, become crisp, and taste salt and sour. This is now eaten with *Ngapi* and rice, or is taken in a dish called *Let-thok* made with roasted sesamum, fried onions and oil.

Cooked—*Boiled*—The shoots are boiled and eaten when soft with oil and salt. This is a favourite early morning dish in Upper Burma. They may also be boiled with tamarind and form an ingredient of the dish *Let-thok*. Alternatively they may be made into soup (*Hincho*).

Fried—They are boiled till just soft, and then fried in oil.

Curried—Prepared in the same way as curried dal, or may form an ingredient of a vegetable curry.

Roasted—(*Ahlaw*)—The shoots are roasted with salt.

Prepared in these various ways germinated pulse, or *Pè-bin-pauk* as the Burmese call it, is a dish of great importance in the Burman dietary. It is eaten by both sexes at all ages, and although I have been unable to ascertain that they attribute any special powers to it in the way of preventing or curing specific diseases, I have been told that it is particularly appreciated in the hot weather, when fresh vegetables are scarce, and am informed by Major Hodgkinson Lack, I.M.S., that it is prescribed by certain *Tsay-sayas*, the local practitioners of Burmese indigenous medicine, in the treatment of digestive troubles.

An interesting speculation is whether germinated pulse is an original article of food of the Burmese, or was introduced from China. It is much used by the Chinese in Burma, and many of those who make and sell it in the bazaars of Rangoon and other large towns are Chinese. Dr. Peters, of the China Health Educational Council, tells me that it is widely used throughout China. Judging from its very extensive use among the Burmese all over Burma, its introduction, if it was introduced, is not of recent occurrence.

I have never personally come across germinated pulse as a natural article of diet in India or among the tribes of Central or East Africa, but Major Tarapore, I.M.S., tells me that he knows of its use among Parsees in Bombay, and I understand that there is a grain known as *Kambo* in Tamil, grown in the Madras Presidency, which is prepared by germination and eaten raw with salt or sugar.

The question of the inclusion of germinated pulse in the dietary of sailors and soldiers, police and other bodies of public servants in receipt of rations, and in institutions, such as hospitals, jails, schools, and asylums is, in my opinion, one of considerable importance. We know that the various deficiency diseases are particularly apt to occur among these several groups of persons, and we know that in germinated pulse we have a useful and inexpensive supply of vitamins B and C. The question is not one of urging the adoption of an experimental and possibly unpalatable

Foodstuff Germinated pulse is already used by at least two nations, who relish it as a highly palatable, nutritious, and inexpensive food, and there is no reason why the use of this preparation should not be made much more extensive than it is. In certain jails in Burma it is now in regular use, and its introduction has been greatly appreciated by the prisoners. It is to be hoped that before long it will be incorporated in the ration of all prisoners in jails and lock-ups in Burma, and I would suggest that those in charge of similar institutions in other provinces of India might with advantage include germinated *dal* in their ration tables, particularly during the hot weather when, as I know from personal experience of jail work, the diet is apt to be unappetising on account of the seasonal scarcity of vegetables. In such circumstances germinated *dal*, prepared in one or other of the ways I have described, provides a welcome and important variation in the diet, and helps to maintain the supply of the anti-scorbutic factor.

By causing pulse to germinate the grain is softened and requires much less cooking than when dry, and in this way we effect an economy in the content of the anti-beriberi factor, part of which is destroyed in the ordinary process of cooking *dal*.

In conclusion I would advise any one desirous of including germinated *dal*, beans, or peas in the rations of those under his charge to experiment with the various different varieties he can obtain, as he will find considerable variations in the rate of germination, the percentage of seeds which fail to germinate, and in the taste and palatability of the resulting product. It is necessary that the supply of pulse be fresh otherwise a large percentage of the grains will fail to germinate and the result will be a mixture of hard and soft seeds which it is impossible to cook properly.

A NOTE ON AN INVESTIGATION INTO THE VALUE OF ESSENTIAL OILS IN THE PREVENTION AND TREATMENT OF CHOLERA

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I DESIRE to draw the attention of the profession to the very great value of essential oils both in the prevention and treatment of cholera.

Owing to the severe annual outbreaks of cholera in the coalfields of Bengal, which resulted not only in great mortality, but also in the prolonged dispersal of labour and consequent financial loss to the coal trade,—but of which it is to be regretted that no exact statistical information is available—the Asansol Mines Board of Health was brought into active existence by the Government of Bengal in the beginning of May 1916.

The area comprised in the Mining Settlement is 413 square miles and includes 202 collieries and 491 villages and the 2 municipi-

palities of Asansol and Raniganj. The population of the settlement according to the census of 1921 is 329,353 to which must be added an estimated floating colliery population, who reside outside the Mining Settlement, of not less than 125,000. Notwithstanding the very elaborate precautions taken by the Mines Board both for the prevention and suppression of cholera the average number of cases of this disease which have occurred in the Mining Settlement since the establishment of the Board has up to date been approximately 1,200 per annum, with an average case death-rate of 50 per cent.

A history frequently to be obtained of an ordinary outbreak of cholera in a village of the Mining Settlement is that the original case was caused by overeating at a "Sradh" or other feast, and that though many partook of the feast none but the patient was in any way injuriously affected by it. The disease began as a simple diarrhoea which through neglect developed after several days into cholera (from this it may be assumed that cholera is endemic in the Mining Settlement). The soiled clothes of the patient were washed by the relatives in a neighbouring tank, and all residents in that section of the village who drank the water of this tank subsequently contracted the disease.

Under such circumstances the first case, if not immediately fatal, often escapes notice for some time, and it is only when the subsequent cases occur that the chowkidar becomes aware of the existence of the disease and forthwith notifies it to the nearest Sanitary Inspector of the Board. Each case is then fully investigated by the Sanitary Inspector. The infected tank is sterilized and kept sterilized with chloride of lime, and placed under guards for ten days to prevent the further use of the water during that period. A solution of some coal tar disinfectant, such as Hycol, is left in each infected house for sterilizing the patient's dejecta, and the relatives in immediate attendance upon the patient are instructed to disinfect their hands with the solution when soiled, and especially before partaking of any food. The great danger of not carrying out these instructions is also carefully impressed upon them. Yet in spite of these precautions, statistics show that not less than 33 per cent or one-third of the total number of cases of cholera in the Mining Settlement are due to infection by contact either from nursing cases or from residence in infected houses. Could anything be done to prevent such infection a very considerable advance in the prevention of cholera would have been secured and it is now believed that this has been achieved by the use of essential oils.

Since 1921, in addition to the information up to that time recorded, detailed statistics

have been kept of all cases of cholera in the Mining Settlement with regard to treatment and results. From these it was found that the majority of patients receive medical treatment from the local practitioner attached to the nearest colliery—the treatment generally consisting in the administration of a "Cholera Mixture" containing chlorodyne or other preparation of opium,—but a considerable number of cases owing to poverty, ignorance, or remoteness from medical aid are permitted to suffer unhelpt.

It also emerged from these statistics relating to many hundreds of cases, that treatment by "Cholera Mixtures" is much superior to no treatment at all, the death-rate of those untreated being 66 per cent while that of those treated by various "Mixtures" was only 46 per cent—a saving of 20 per cent of lives. It therefore appeared to the writer that the Board, on humanitarian as well as on other grounds, should undertake the treatment of those cases for whom medical aid was not otherwise available.

The question then arose as to what treatment should be adopted by the Board as its standard treatment, since there were statistical reasons for believing that chlorodyne mixtures, although undoubtedly capable of reducing the mortality from 66 per cent to 46 per cent, were not necessarily the best available remedy for field work, and that even better results might be obtained from other forms of treatment.

Certain investigations with the assistance of local practitioners had previously been made into the value of Kaolin as a treatment, but it was found from experience that though the results were very satisfactory (the death-rate being 25 per cent) the treatment was not popular and that it would be idle for the Board to adopt it as a standard treatment if any considerable number of lives were to be saved. Saline injections were out of the question, as being only suited for use by a trained medical staff which the Board does not possess. It was therefore decided to investigate the value of the old-time remedy of a mixture of essential oils with alcohol, ether, and sulphuric acid, as it seemed to the writer that a remedy formerly so highly esteemed and so widely used throughout India, could not be without special merit. Accordingly in July 1922 the Board on the writer's recommendation voted the sum of Rs 250/- for the purpose of carrying out this investigation.

A mixture based on the following formula was thereupon made up and brought into use

R)	Spt Aether	"	m/30
	Ol Cloves	"	
	Ol Cajuput	"	
	Ol Juniper	"	aa m/ 5
	Acid Sulph Aromat	"	m/ 15

Misce :

Dose—One drachm, in half-an-ounce of water, every half hour until vomiting and purging cease. (This generally takes place after 5 or 6 doses).

For Contacts—One drachm in water, once (or twice) daily for one or two days.

(The mixture can be easily made up in bulk by mixing 1 lb oil of cloves, 1 lb oil of cajuput and 1 lb oil of juniper with 6 lbs spt aether and adding 3 lbs acid sulph aromat).

In one of the outbreaks in which this mixture was first tried, several cases of cholera chanced to develop amongst the infected (who had drunk the water of a contaminated tank) whilst the Board's staff were actively engaged in treating those already taken ill, and it was observed that in these incipient cases one or two doses of the mixture at once stopped both vomiting and purging, and aborted the disease. It seemed therefore to the writer, that the mixture if capable of aborting the disease at the stage of vomiting and purging, should *a fortiori* be capable, under ordinary circumstances if given in time, of preventing its development altogether, and orders were therefore issued to administer one dose of the mixture in future to all those exposed to infection by nursing or by residence in infected houses whether the patients were being treated by local practitioners or not.

The mixture has now been administered to several hundreds of such contacts, and in no instance has any case of cholera developed amongst them, although, as we have seen, the number of cases normally to be expected is not less than 50 per cent of the number of original cases.

The great value of this observation will at once be apparent to all those who have to deal with outbreaks of cholera from a public health point of view, and I publish this preliminary note for the benefit of District Boards, tea garden authorities, and others who have to deal with such outbreaks. With this remedy available no anxiety need now be felt of the spread of the disease by contact, as one dose of the mixture daily to those immediately exposed to such infection, would seem to be a certain preventative of the development of the disease. I would also point out that the mixture possesses considerable advantages over cholera vaccine as a prophylactic from an administrative point of view for whereas vaccination is costly and unpopular, the mixture is both cheap and pleasant to take.

The curative value of the mixture, in all stages of the disease short of collapse, is also not to be lost sight of, the death-rate of those treated in the Mining Settlement with the mixture being 16.6 per cent up to date.

Further investigation may show that this figure as an average death-rate requires modification, but there is no doubt that in the essential oils we possess a most valuable remedy for

the treatment of cholera as well as a highly effective prophylactic against it

A SHORT NOTE ON THE IMPROVEMENT OF THE POONA WATER-SUPPLY BY SIMPLE STORAGE

By DR. J. L. PINTO, DPH,

Asst Director of Public Health, Poona

THE raw water from the canal before being admitted into the Paterson coagulating tanks or filters is allowed to settle for a few days. The water is first pumped through a duct into a large settling tank. There are five such tanks. They are connected with one another and a constant level is maintained in all. The capacity of each tank is 12 million gallons, the total capacity being 6 million gallons. The daily draw is about 2 million gallons. Hence theoretically the water settles for about 3 days before entering the Paterson filters. The engineer in charge, however, states that the actual time taken by the water to traverse the series of tanks is about 60 hours. Thus in each tank there is a settlement of approximately 12 hours. It was noticed that the raw water at its entry to the Paterson filters was considerably improved by mere settlement. To determine, therefore, the amount of improvement during its course, a series of samples were taken daily for four days—two from each tank. The points selected for taking these samples were somewhere near the inlet and outlet of each tank. The samples were tested for total colonies on agar and bile salt agar, as well as for lactose fermentors. The average result for the four days (October 12, 13, 16 and 17) of samples at each point were as follows—

Settling Tanks	TOTAL COLONIES		Percentage reduction calculated on count of 1st tank at inlet	
	Ordinary Agar	B S Agar	Agar	B S Agar
I Tank Inlet	425.50	119.75		
Outlet	422.50	106.00	0.70	11.43
II Tank Inlet	416.66	98.75	2.07	17.53
Outlet	398.00	78.50	6.46	33.61
III Tank Inlet	285.00	50.00	33.02	58.25
Outlet	280.25	53.00	34.13	55.74
IV Tank Inlet	175.50	57.50	58.75	73.03
Outlet	208.25	42.00	51.05	64.92
V Tank Inlet	133.25	22.50	68.73	81.17
Outlet	108.25	19.50	74.55	83.71

The lactose fermentors gave almost uniform results in samples from all the tanks. On 12th October (1st day), they were all found positive in 10 c.c., except one sample of Tank I from its inlet, which was positive in 1 c.c. On the 13th they were all positive in 10 c.c. On the 16th they showed none in 10 c.c. and on the 17th positive in 1 c.c.

The filtered water on these four days (October 12, 13, 16 and 17) gave an average result of 8.50 colonies on agar and 0.50 on bile salt agar, thus showing a reduction of 98 per cent and 99.58 per cent respectively on the counts of the Tank I at inlet (raw water).

The chlorinated water for the same days gave an average of three colonies on agar and none in bile salt agar.

The results tabulated show a gradual reduction in bacterial content in the water from tank to tank, amounting to 0.7 per cent during its settlement in the first tank, and attaining to practically 75 per cent purification in the last tank, at the outlet, as judged by colonies.

Therefore it may be concluded that the amount of improvement of Poona water by the mere process of settlement for about 3 days is nearly 75 per cent before it undergoes the further process of purification by filtration and chlorination. It may be noted that this would not necessarily apply during the monsoon when the raw water is loaded with colloidal clay and when the problems of purification differ somewhat from those obtained during the non-monsoon months.

A Mirror of Hospital Practice.

A FURTHER NOTE ON MYIASIS OF THE FRONTAL SINUS

By MAJOR R. E. WRIGHT, I.M.S.,

Govt Ophthalmic Hospital, Madras

IN the *Indian Medical Gazette* for February 1921, I published in conjunction with Major W. S. Patton, I.M.S., some "Notes on Myiasis of the Frontal Sinus." If I am not mistaken it was the first human case ever published in which the flies were hatched from the larvæ. It may be of interest to record a second case now—

C, age 1 year, of Saidapet, was brought to the Government Ophthalmic Hospital, Madras, on 19-9-22 with a suppurating sinus over the middle of the left eyebrow. The left side of the forehead and nose were extensively inflamed and œdematous. The lids on this side were much swollen and closed, and there was excoriation of the skin all round the orbit. The eye-ball itself was in good condition. The sinus in the brow showed a punched out edge

leading into a bony cavity in which live maggots could be seen. Some of these maggots were removed and sent for identification to Major Patton in Edinburgh, who kindly writes as follows —

"Edinburgh, 22-11-22

Many thanks for your letter and the specimens which came this week. The larvæ are those of *Chrysomya bezziana* and are typical specimens."

The mother of the child could not state exactly how long the condition of suppuration had existed and it is needless to record her ideas on the subject. The maggots were removed by irrigation and during the irrigation it was noted that no fluid appeared to come through into the nose. On 16-9-22 I carefully explored the sinus and found that



the opening into the brow led into a tiny round frontal cells about 1 cm in diameter. It was fairly easy to pass a blunt probe into the nasal cavity. One could not of course be quite certain whether this passage was the normal ostium of the cell or whether it had come into existence on account of erosion of the bone. Drainage was well established into the nose and a gauze wick led through into the nasal cavity. Healing took place rapidly and the child was discharged apparently well on 29-9-22. It is very rarely indeed that we meet with (or recognise) frontal sinusitis in such a young child. I have elsewhere given an idea of our experience in this hospital as regards sinusitis invading the tissues in and round the orbit (*British Medical Journal*, April 16, 1921). The majority of cases with orbital or circumor-

bital cellulitis or abscess which apply to us for relief are of the ethmoidal variety. In such a young child the frontal sinus when it exists at all, is a very small diverticulum indeed and usually its ostium is short, opening straight into the anterior part of the recessus frontalis, giving little opportunity for an acute empyema. Professor J. P. Schaeffer ("The Nose and Olfactory Organ") records the height of the cupola of the frontal sinus in the first year of life at 1.5 to 2 cm below the nasion. In this case the cell must have been exceptionally large if one takes it for granted that erosion of bone had not taken place to any extent. Of this I cannot be quite certain as the mucous membrane of the frontal diverticulum had certainly disappeared, although the bone was comparatively smooth. If it is rare to come across a perforating frontal sinusitis in such a young subject, it must be very much rarer for such a condition to be complicated by the presence of *Chrysomya bezziana* larvæ the more so, as Major Patton has pointed out that the *bezziana* larvæ do not ordinarily inhabit the accessory sinuses as do the numerous larvæ which one is accustomed to see in the air cells of herbivorous animals, but rather are deposited on ulcerating surfaces and thrive on living tissue. It is a very curious coincidence, therefore, that I should have met with a second case of frontal sinusitis ulcerating through in the super-orbital region on which *bezziana* eggs were deposited. One wonders if it is anything more than coincidence. Major Patton is apparently very definitely of opinion that the larvæ of *bezziana* do not find their way into the nasal sinus through the nose, and certainly in neither of the cases here referred to was there any evidence whatever that they had done so. The photograph shows the child's appearance on admission.

A CASE OF RAYNAUD'S DISEASE

By DR. SARASI LAL SARKAR,

Civil Surgeon, Malda

RAYNAUD'S disease is a rare affection which occasionally comes to the notice of the medical practitioner. As far as I can remember, the present is the second case of this affection which has come to my notice in about 25 years of medical practice. Thinking that it may be of interest to the medical profession to preserve clinical notes in the case of a rare disease such as the present, I have tried to give below the clinical history, with a photo of the hands and feet of a case which has recently come to my notice.

Sukua, Mahomedan male, aged about 60 years, living in a village situated about

2 miles from the hospital, attended on the 6th January, 1923, for treatment of swelling of the tip of the right middle finger attended with almost unbearable pain. The man was admitted into the in-door ward for treatment.

Family History—Patient's father died of fever and his mother of cholera. Amongst his near relatives, one of his daughters is suffering from mental disease which commenced a few months after her delivery. His maternal uncle has leprosy.

Personal History—The patient is by profession a skilled artisan who constructs thatched houses for villagers. He lives on ordinary Mahomedan diet. He has been in the habit of taking opium for the last 20 years as a luxury,



he also smokes tobacco. He is of medium build and in consideration of his age is in good health. He is fairly intelligent.

History of the previous attacks—One winter about 20 years ago the patient got a swelling of his left foot, which lasted for a few months. Later he began to feel pain in the swollen part. Suddenly one evening when he was walking, he sustained a slight injury to his left big toe. He began to feel burning pain at the site of injury which became black in colour and ultimately ulcerated and a portion of the toe dropped off. After this the patient was free from the trouble for some years.

Seven or eight years after this, the patient one winter got a similar attack of pain and swelling of his right foot and this time a

portion of the right big toe dropped off. The condition of the toes can best be seen from the photograph.

During the intermediate period from the last attack to the present attack he was in good health.

Commencement of the present attack—According to the patient, the swelling of the right hand commenced last year. He does not remember the month. At first he felt slight pain on the inner side of the palmar surface of the hand. Two or three months after experiencing the pain both the dorsal and the palmar surface of the hand gradually became swollen. He experienced a throbbing pain in the hand, increasing at night and interfering with sleep. The pain appeared to be somewhat relieved by pressure on the wrist or by a ligature round the lower part of the forearm. At this stage he applied a native method of cupping over the swelling, which consisted in making superficial incisions and then blood was sucked up by applying a hollow brass tube over the incisions. This relieved the pain and swelling and he was all right for about eight months. Then the swelling and pain relapsed about the commencement of last winter. The whole of the hand with the fingers gradually became swollen and he noticed a blackish colour of the terminal phalanx of the middle finger of the hand and began to feel slight pain on the base of the outer side of the nail. This pain gradually increased in intensity and he began to feel burning and piercing pain which he tried to relieve by placing the hand in cold water and applying indigenous medicines to promote suppuration, without any effect. Then he sought admission to the hospital.

General condition of the patient—The patient was carefully examined. No abnormality was found in any system except that the knee-jerks were somewhat exaggerated. The tongue was slightly coated and fissured, bowels somewhat constipated. The circulatory and respiratory systems were perfectly normal. The following is the result of the analysis of urine—Colour—straw-yellow, specific gravity—1015, reaction—slightly acid, no albumin, phosphates, sugar, bile or pigment.

Local condition and subsequent progress of the case in hospital—At the time the patient entered hospital there was marked discoloration and swelling of the terminal half of the terminal phalanx of the right middle finger. There was marked excruciating pain on account of which the patient could not sleep at night. To obtain relief he dipped the fingers in the permanganate bath provided. Application of a band round the forearm gave some relief. Gradually the colour of the finger deepened and the nail became loose. At this stage the pain became greatly relieved.

After this the upper part of the finger gradually dried up and a line of demarcation clearly formed at the base of the part of the finger which had undergone a sort of dry gangrene after the separation of the nail. The line of demarcation is clearly indicated in the photograph.

The patient was admitted on the 6th January, 1923, and on the 19th January, 1923, at the request of the patient I cut off the gangrenous portion, just over the line of demarcation and there was no oozing of blood. The tissues beneath the dried skin presented a caseous appearance and contained a little creamy fluid. The bone exposed by the line of incision was cut off by bone nippers and showed the presence of a little blood, showing that this had not gangrened to the level of the superficial tissues. The patient made an uninterrupted recovery within a few days.

The case presents the typical clinical signs of Raynaud's disease. The three attacks occurred at intervals of about eight years. The œdema of the foot and the hand attacked preceded by a considerable time the manifestation of the sign of dry gangrene which is so characteristic of the disease. In different text-books which I have consulted with regard to the symptoms of the disease, none describes the variety of the disease preceded by symptoms of œdema a long time before the occurrence of dry gangrene, as was found in this case.

A CASE OF ABSENCE OF THE LEFT LUNG

By KHAN SAHEB NUR MUHAMED,
Civil Hospital, Ferozepore City, Punjab

THE body of a woman named Akko, aged 19 years, sweeper caste, was sent by the police on the 10th January, 1923, for examination. She was said to have died on the 6th January by drowning in a well. On external examination there was only a Colles' fracture of the right wrist, and a few scratches on the upper part of the chest were present, which were probably produced after death whilst removing the body from the well.

The body was well developed, post-mortem rigidity was passing off but was present in the jaw muscles. The body was not decomposed. There was no deformity of any kind present. Both sides of the chest were symmetrical.

On opening the abdomen the liver was found ruptured for more than four inches in the right lobe and the spleen was found ruptured at its hylum for three inches, the peritoneal cavity was full of blood. The other organs were found normal. The stomach contained no fluid and no food.

On opening the chest the right lung was found most prominent and it was covering

the heart and extending over to the left side of the chest. The left lung was not evident as the pericardium was full of blood and most of the lower part of the cavity of the left side of the chest was occupied by the pericardium. On opening the pericardium and removing the blood I found that the heart was ruptured in both ventricles.

After removing the heart I searched for the left lung and found that a very thick pleura about $1\frac{1}{3}$ inch thick was lining the upper part of the left side of the cavity of the chest. With the greatest trouble I separated the pleura from the chest wall and after opening it I found a small triangular cavity about 2 or $2\frac{1}{2}$ inches long on each side of the triangle but no left lung.

It was then evening and I left the post-mortem unfinished to show the case to the Civil Surgeon as the condition was a novelty to me. I called upon the Civil Surgeon next morning and told him all about it but Colonel J. G. G. Swan, I.M.S., C.I.E., the Civil Surgeon, told me that he had never heard of such a thing before and he promised me to bring with him Major Keyworth, I.M.S., and both these officers came and found only one lung and the trachea entering the right lung direct without any division. They found a bilobular glandular structure on the left side of the cavity, which on microscopic examination was found to be the thymus gland but there was also present a prominent second thymus gland in its usual place lying in the anterior mediastinum, whilst the first thymus gland was lying in the thick pleura of the left side in the apex region.

The woman had lived for 19 years with only one lung. She was married. She appeared to have suffered no inconvenience from the absence of one lung. There was no evidence of illness (except that she was alleged to have been insane at times as elicited from her relatives). She was well nourished and there was no evident deformity of the chest from the middle of the spine to the middle sternal line, the measurement being $14\frac{1}{2}$ inches exactly on both sides.

Section of the heart show normal muscle fibres with in places some pigmentary degeneration (brown atrophy).

FIVE CONSECUTIVE CASES OF TETANUS ENDING IN RECOVERY

By RAO SAHIB R. S. TEMBE, L.M. & S., D.M.S.,

Medical Officer, Kalyan

Case No 1—Female, agricultural Hindu, developed symptoms on the 11th day after delivery. Treatment began two days later, when there was complete lockjaw and severe cramps of the muscles of the whole body. The temperature ranged between 101° and 103° F.

3 Treatment consisted of —

1 Injection subcutaneously of tetanus antitoxin (B W & Co's) 3,000 units in one dose

2 Injections of 15 mins of 1 per cent solution of carbolic acid, one injection every day for four days

3 Routine mixture —

Pot. Bromide	grs 60
Chloral Hydras	grs 30
Eserine Sulph	grs 113
Liq Morph Hydrochlor	min 40
Magnesi Sulph	drs 1v
Water to make	ozs 1v

One ounce 4 times a day

The case showed signs of improvement from the sixth day and recovery was complete after the 24th day

Case No 2—Male, young Mussalman of 22, milkman. Probable source of infection was through a septic sinus due to guinea-worm. He consulted a local practitioner for being unable to open his mouth. He was thought to be suffering from local septic trouble and was given gargles. As the case got worse, he was shown to me when he had complete lockjaw, stiff neck, arched back, blue face, frequent painful cramps, temperature between 99° and 102° F. Treatment was the same as above, except that the injections of carbolic acid were continued for 8 days. He took over a month for complete recovery. The antitoxin used was from P D & Co.

Case No 3—A high caste Hindu lady, aged 20, developed signs of lockjaw on the 8th day after delivery. Treatment was begun two days later. All the symptoms were more severe than in the first two cases.

The treatment given consisted of 6,000 units of antitoxin (Lister Institute) on the first day and 3,000 units on the second day, routine mixture and injections of carbolic acid for 12 days. The fever used to be between 101° to 104° F. Cramps were very severe and very painful. She took over a month and a quarter for recovery from all symptoms. The symptoms were more or less stationary for the first 10 days.

Case No 4—Mussalman boy of 7. No definite source of infection could be seen, except that the boy had several pustules due to scabies. He was brought to the dispensary for severe and recurring bleeding from his tongue which was severely bitten. It was on the day following that the diagnosis of tetanus was made from the peculiar state of contracted muscles of the face, jaw and the forehead. 1,500 units of antitoxin (Lister Institute) were injected and the boy was put on to the usual mixture in proportional doses. Injections of carbolic acid solution were given for 7 days. The case went from bad to worse for 5 days, when another 1,500 units of the antitoxin were injected. After this injection

the case went on improving and the boy was all right in about 25 days.

Case No 5—Mussalman boy of 15, poultry keeper, got injured by an iron nail, the wound becoming septic. On the 7th day he developed symptoms. Two days later I was shown the case. It was a very severe case of tetanus. The whole body was stiff and arched, the boy was getting very painful cramps at frequent intervals, temperature 103.8° F, pulse 140. 1,500 units of antitoxin (Lister Institute) were injected at once and the boy was put on to the usual mixture. Carbolic acid injections were given for three days, when another 1,500 units of the antitoxin were injected. The father took away the mixture for three more days only, and I heard no more of the case. I thought that the boy must have died. Fifteen days later the father met me on the road and told me that the boy got well after they gave an offering of a goat to the "Pir".

I publish these notes for what they are worth without attempting to draw any conclusions. All cases except No 4 were virulent in my opinion.

A CASE OF HYDATID CYST OF THE LIVER

By DR. SAURANGANATH BANERJEA, M.B.,
Chief Medical Officer, Dhenkanal

THE following case illustrates the fact that signs and symptoms strongly suggestive of the presence of abscess of the liver may be the result of quite a different condition of the liver.

A C M, Hindu Brahmin, male, 20 years of age, student, Ravenshaw College, Cuttack, never in foreign lands—his geographical vision being limited to Cuttack from Dhenkanal, gave a history of recurrent attacks of dysentery extending over a period of two months and then fever for a month after the dysentery had subsided. As the fever, diagnosed as malarial fever, did not leave him even under vigorous quinine treatment at Cuttack, he was advised to go home with the idea that a change would do him good, when back at Dhenkanal he came to me for treatment.

His condition was as follows—Patient pale, anæmic, with earthy tint and redness and distinct bulging of right hypochondriac, epigastric, umbilical and lumbar regions.

There was tenderness and a feeling of fullness and tenseness over the swollen area. Pain was produced by pressure over the swollen area and lower intercostal spaces on the right side. The swelling had a more solid feeling on palpation than a fluctuating feeling of pus under pressure. There was absolute dullness on percussion over the bulging area of the abdomen. On auscultation crepitations and friction sounds were heard on the right side of the chest at the front and back.

No definite history as to the onset of the swelling in the liver region could be obtained from the patient. To quote the patient's own words "the very day I got home, the previous disease (referring to malarial fever as diagnosed at Cuttack), ceased and another one prevailed which you say is enlargement of the liver." Probably the swelling developed painlessly at first and hence no notice of it was taken. Pain was felt first at Dhenkanal on the right side of the back a little below the neck and limited to an area which could be covered by a rupee, gradually it extended to the whole of the right side of the back within a couple of days and then to the right shoulder and down to the right elbow. The pain, to use the patient's expression was like the pain which a man feels on his elbow when he gets a severe blow on it from a heavy substance such as an iron bar. The pain was worse at night than in the day. It was increased on coughing and on deep inspiration. Alteration in position of the patient used to make but slight difference in the severity of the pain, on sitting or standing a sensation of heavy weight was added to the pain unless the stomach was recently filled with food when the patient could bear the weight more easily, by lying on his right side a sensation of heaviness was added to the pain. By lying on his left side a sensation of dragging pain was felt, the only position in which the patient used to feel himself comfortable during his illness was when lying flat on his back.

The fever was irregular. The range of temperature was also variable being sometimes very high and sometimes only a little above normal. Fever was never continued for more than four hours and it never remained after 9 p.m. Nausea and vomiting generally used to accompany the rise of temperature. When the patient came under my treatment his temperature was noticed to rise invariably towards evening after 4 p.m., with rigor, a hectic flush of cheeks and bright eyes, and used to leave him with sweating at night.

Indigestion with constipation was also a prominent symptom.

The temperature was brought under control by daily injections of emetine hydrochloride for a week and the constipation by an aperient pill.

As, however, the swelling and pain were not influenced by the injections and pills aspiration was advised.

Aspiration was performed in the 9th intercostal space about $1\frac{1}{2}$ inch above the costal arch. The needle at once passed into a fluid cavity.

The result of chemical analysis of the fluid as made at Cuttack, was as follows—Quantity 3 ounces (about), colour—pale yellow, odour—nil, Sp. gravity—1008, reaction—neutral, urea—nil, pentose reaction—nil,

fat—nil, albumen—present, hydatid hook-lets—two present, daughter cysts—nil.

After the fluid was drawn off, all the signs and symptoms subsided. On the third day after aspiration pain was complained of in the right hypochondriac region. The pain did not trouble him much, yet it was there, but disappeared after several applications of anti-phlogistine over the affected area. It is now about a year since the patient was aspirated and the patient gets himself examined by me each time he comes back here, and I do not find anything wrong with him now, nor does he complain of any symptoms.

A suggestion as to the source of infection which may be advanced is that the patient most probably caught the infection from some infected Australian dog in the College hostel at which he was a boarder.

A CASE OF ABDOMEN PUNCTURED BY A BROKEN BOTTLE

By L. W. HEFFERMAN, M.R.C.S., L.R.C.P. (Lond),
Asst. Chief Medical Officer, Burma Corporation, Ltd., Nanttu

In the early hours of the morning a small Burmese girl, aged about 6 years, was sent into the Nanttu General Hospital from one of the outlying dispensaries with a small punctured wound of the abdomen situated $\frac{3}{4}$ inch above and $1\frac{1}{6}$ inch to the left of the umbilicus. A probe showed the puncture to extend downwards and to the right, and passed into the peritoneal cavity.

From the history it appeared that she was carrying a bottle and fell with it. A broken fragment (see photo) penetrated the abdomen to the extent shown by the darkened portion.

Operation—On opening the abdomen it was seen that no viscera or blood vessels were injured, and the abdomen was closed and a rubber tube inserted.

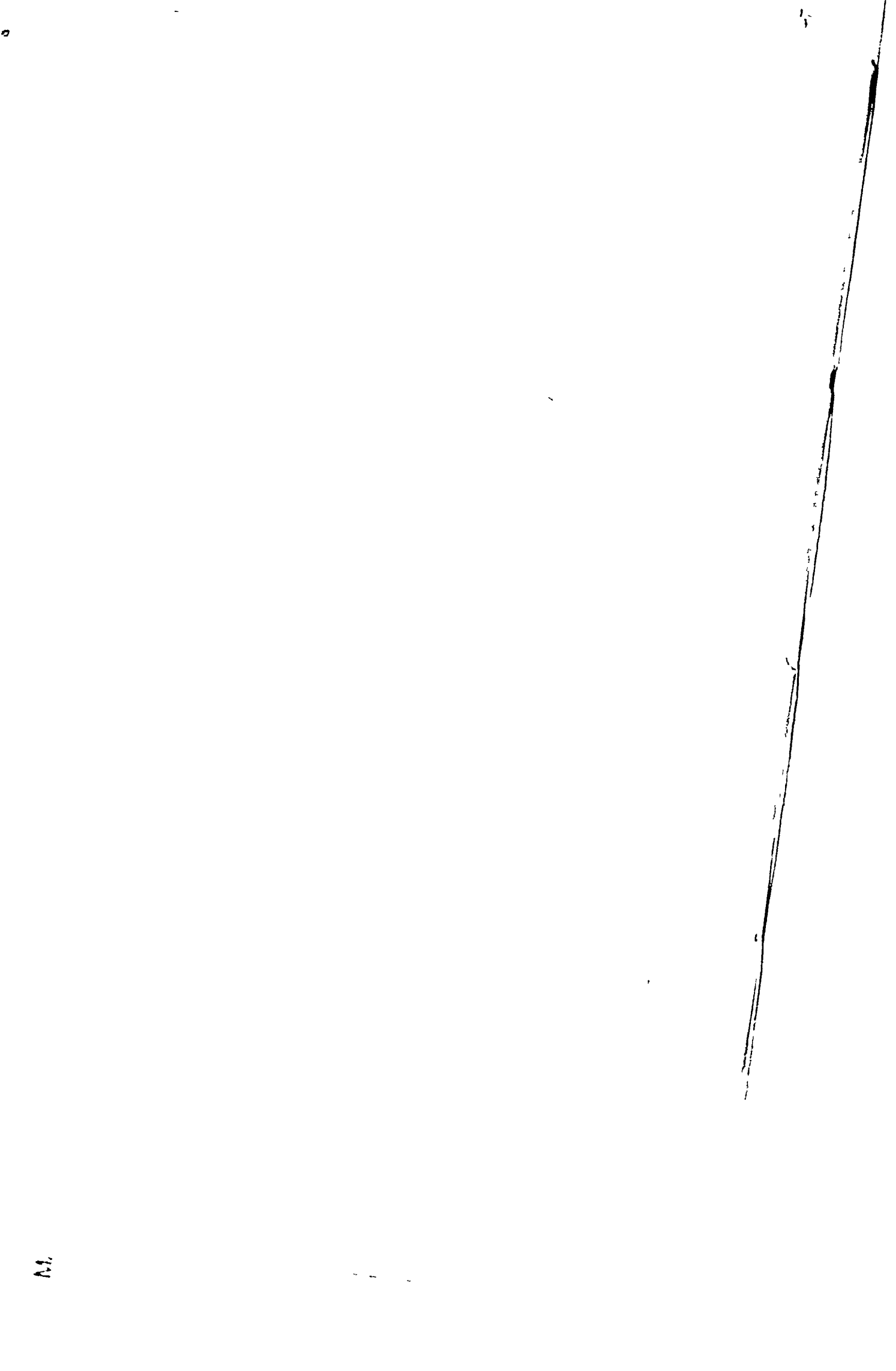
The wound healed by primary union and the abdomen during the post operation period was flaccid and free from pain. From the very first day after operation, however, the temperature was 101.2, pulse 120, respiration 48, and the patient had a troublesome cough. The patient developed pneumonia, both lungs becoming affected, with the result that she also developed a ventral hernia due to her incessant coughing. Her temperature dropped to normal on the 10th day, but she had two sharp rises on the 11th and 12th days. There was some question of sub-phrenic abscess and the X-ray showed better movement of the diaphragm on the right side than on the left. Her temperature and general condition from the 13th day remained normal, however, and she left on the 17th day after operation looking and feeling quite fit, having had a normal temperature and pulse for 5 days. She is at present (four months later) quite well, but has a ventral hernia.

A CASE OF ABDOMEN PUNCTURED BY A BROKEN BOTTLE

By L W HEFFERMAN, M R C S, F R C P (Lond),
Assistant Chief Medical Officer, British Corporation Ltd , Nambur



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Indian Medical Gazette.

JUNE

THE ANKYLOSTOMIASIS PROBLEM

WE are inclined to regard the hookworm problem as being nearer to complete solution than most of the other problems of medicine and yet Colonel Clayton Lane finds reason for doubting whether present work is being done on the right lines. In the *British Medical Journal* for March 31st, 1923, he challenges the opinion of the large body of workers who are in favour of mass treatment of communities which are known to be infected. Those who hold this opinion argue that light infestations are of no importance, that they are not capable of being detected with certainty, and that mass treatment will rid any body of persons of from 93 to 97 per cent of their infection with the result that they will be freed from their disabilities and at the same time soil contamination will be reduced to a negligible quantity. Lane combats each of these views, he holds that light infections may be harmful, that the lightest infections can be detected with certainty by his new centrifugal method, that two courses of treatment with oil of chenopodium cannot be trusted to rid the victim of over 93 per cent of his worms and that mass treatment has not been proved to be either justifiable or politic. He next goes on to argue that hookworm infection of the soil is not widely disseminated, he quotes Augustine, who says that a ring of four inches in radius round an infected stool represents the limits of migration of the larvæ, and accepting this observation he goes on to suggest the name of "privy infection" to designate the strictly limited nature of the soil infection. He is careful to define the term "privy infection" as meaning infection of any place which is used by a human being for the purpose of defæcation, whether this be a latrine or a spot in the open field, and he suspects that all man-made latrines except sewered latrines are disseminators of infection. He argues that even the eggs resulting from less than nine worms may cause dangerous infection of the place which is used as a privy and that further systematic research is needed to devise a "simple, cheap, profitable, fool-proof latrine suitable for the poor hut dweller."

He holds that research has not yet brought us to the stage at which heavy waste of money can be avoided in anti-hookworm campaigns. In

so far as the paper calls insistently for further research for the purpose of improving our methods of prevention and treatment of the disease every one will heartily agree with it, but it is not likely that the paper as a whole will escape criticism.

Some of the points which call for special consideration are

I Are Augustine's findings of universal applicability? It is almost inconceivable that the infection from a stool passed on the ground in wet weather should remain closely restricted to the immediate spot where it is passed.

II Even if it did, the term "privy infection" seems to be likely to give rise to serious misunderstanding. Such a term is likely to be seized on by many who do not know of the special sense in which it is used by Lane, and the consequence may be that the latrine which is one of the great hopes of the anti-hookworm campaigner may be undeservedly discredited. The word privy is a humble unit of the King's English, it is hardly likely that it will be generally employed in the highly specialised sense in which it is used by Lane, and for this reason it would perhaps have been better to introduce a special term to indicate strictly localised soil infection as opposed to diffused soil infection which is believed in by some. Clayton Lane could probably find a suitable term, "spot infection" might be suggested or some compound word indicating "stool spot infection" might be devised.

III Even if one or two worms may be capable of doing harm to the host it is likely that hundreds or thousands of worms will do much more harm, so that there are good grounds for hoping that a great reduction in the number of worms may be of great benefit to the individual.

IV The same argument applies to soil infection and to latrine infection. If the persons who are contaminating a place pass less than one-tenth of the former number of ova the danger to others ought to be correspondingly diminished. It is quite possible that if the number of hookworms infecting the people of a place are reduced to one-tenth the harm that results from them may become almost negligible, it will certainly be greatly diminished.

In spite of all the work that has been done on the subject we are still in ignorance of the percentage loss of efficiency caused by a certain degree of hookworm infestation of the people of a place, but presumably this varies with the

heaviness of the infection, and if it is practicable to replace a heavy loss of efficiency by a slight loss of efficiency we ought to proceed with that reduction in the infection even if we are unable to attain to the ideal of complete sterilization. The problem is on much the same lines as that of malarial prevention and cure. In spite of all the work which has been done on malaria we know how difficult it is to effect complete abolition of the disease either in the community or in the individual, but in the meantime we gratefully accept what has already been accomplished, as we know that short of complete success we can easily attain to a great diminution of the sickness and death resulting from the disease.

We heartily agree with Clayton Lane when he urges us to strive for perfection, but we think that he hardly does justice to the results which have already been attained, for example in the Southern States of America, where the hookworm campaign has not only resulted in a great reduction in the incidence of hookworm disease, but has also aroused the people to a sense of the value of public health measures in general.

It is to be hoped that the valuable critical contribution of Clayton Lane will produce the result desired by the author, *viz*, a striving to attain to more perfect methods of treatment and prevention of the disease, but we hope that it will not create a pessimistic attitude towards what has already been accomplished.

The work of McVail and others suggests that at certain times of the year soil infection is reduced to a minimum in many places. Mass treatment at such times may result in a practical abolition of soil infection during the following infective season. Here is a line which ought to be followed up. The work of devising the ideal latrine ought also to be pressed forward and so should the attempts to discover an ideal drug for the cure of the disease. We may be nearer a practical solution of the problem than we imagine, and in the meantime the work of education and the employment of the means which are already at our disposal should by no means be slackened, merely because we have not attained to the ideal, for the attainment of which we may still have to wait for some years.

THE INFLUENCE OF THE SUBSTRATE ON THE ACTION OF DRUGS

DURING the last few years, a considerable amount of work has been done on the hydro-

gen ion concentration of the blood in health and disease, as well as on its influence on the rate of multiplication of bacteria in artificial media. Whilst working in Dr H H Dale's laboratory I noticed whilst testing the action of the cinchona alkaloids on *Paramecium caudatum*, that this ciliate was easily destroyed in the afternoon, whilst in the morning it appeared to be quinine-resistant. In order to avoid contaminating the stock culture, it was my practice to take up 50 c.c. of the stock and place it in a sterile Petri dish, and from this volume carry out the whole of the experiments for the day. At 10 o'clock in the morning a 1-10,000 dilution was necessary to kill these ciliates, whilst at 2 o'clock a dilution of 1-100,000 was sufficient to destroy with certainty every individual. As the same culture was being used this effect could be due to any differences in the strain of these ciliates. With the help of Drs Dale and Lovatt Evans I was able to show that the variation in vitality was due to an alteration in the hydrogen ion concentration of the culture. The 50 c.c. when removed from the stock culture contained a good deal of CO_2 , on placing this culture in a thin layer in a Petri dish most of the CO_2 was given up and at 2 o'clock in the afternoon the pH was then about 8. During 1921 I had the opportunity of reading carefully Einstein's "Theory of Relativity". Here in the chemical world of ultramicroscopic ions, atoms and molecules one could visualise a similar phenomenon, but with this difference that the individual particles could not be seen, but only their gross effects. Thus in a substrate with a pH of 7, we can regard *Paramecium* as to having a pH of 7 or thereabouts, like many other tissues of the body and the quinine molecule behaving as a base, to have a negative charge. In such a substrate, the quinine molecules would be dispersed equally into the substrate and on the ciliate and so the action of this alkaloid would appear to be relatively weak in its effect. In an alkaline substrate with a pH of 8, the quinine molecule and the OH ions which are now in excess would have no attraction for each other, under these conditions if a *Paramecium* with a pH of 7 enters into such a field, every quinine molecule in its vicinity would tend to go towards the ciliate, and so the alkaloid would appear to be ten times more powerful in its action. At the same time I tested the action of emetine on these ciliates and found the same phenomenon to be present with this alkaloid.

Michaelis showed that most of the inorganic antiseptics act better in killing bacteria when acting in an acid substrate, this is undoubtedly due to the greater number of metallic ions set free by the excess of H ions. In a recent number of the *Journal of the American Medical Association* 1922, No 78, p 1519, the minimum dose of crude botulinus toxin for mice was found to be 3×10^6 cc, i.e., 0.000,003 cc. This toxin is capable of an extraordinary potency when acting in a pH of 12 such as occurs in the stomach during digestion. In such a substrate the lethal dose was found to be only 3×10^{-21} . Major Chopra and myself have lately been working on the various poisonous amines, and found that many of them act best at a pH of 7.2, i.e., about the pH of arterial blood. Many of these amines functionate as ampholytes, and can therefore behave as acids or bases at this hydrogen ion concentration. We can therefore classify these poisons into three groups depending on their behaviours in the substrate into—

(1) Inorganic bases—e.g., salts of heavy metals, which function better in an acid substrate, owing to the number of free ions available

(2) Organic bases

(2a) Bases that act better in an alkaline substrate of a pH of 8, e.g., the alkaloids emetine, quinine, as well as some amines such as trimethylamine

(2b) Bases that act at a particular optimum pH. Thus epinephrin and tyramine act best at a pH of 7.2, or botulinus toxin at a pH of 1.2

As the reaction of the substrate played such an important part in the action of these drugs and poisons it was necessary to test the pH of the different organs of the body. With the help of Dr Sudamoy Ghose, D.Sc., we tested the pH of the various internal organs by dialysing through a collodion membrane and then testing by means of indicators. The results are only comparative but they show that the liver is the most acid organ in the body—especially in carnivora, then comes the brain, and after that the various internal organs such as the spleen, kidney, etc. During the war I noticed that the stools of cases suffering from amœbic dysentery when tested by litmus paper were acid in reaction, whilst those of bacillary dysentery were alkaline. Lately working on this point with Knowles, we found that the stools of the acute amœbic cases had a pH of 6.2 or thereabouts. These findings explain why metals like iron, arsenic, etc., are deposited in the liver in preference to other organs, and why emetine

sometimes fails in amœbic dysentery. The blood is the great circulating fluid of the body through which the drugs act and its alkali reserve is made up of bicarbonates, phosphates and various bases derived from the proteins, as well as the proteids themselves. In health the reaction of the blood is maintained in a state of absolute equilibrium owing to these substances being present in constant quantities. A diminution in the amount of the alkali reserve is spoken of as acidosis. This reserve is encroached upon by the CO_2 present in the blood, partly in solution and partly in combination as carbonates. Any increase in the CO_2 increases the pH towards the acid side, this stimulates the respiratory centre, with a consequently greater loss of CO_2 by pulmonary ventilation, so that the reaction of the blood is kept within constant limits. The non-volatile acids during health are absorbed largely by the liver, which accounts for the acidity of this organ as well as for its detoxicating function, for at this pH very few of these organic bases are active. In disease when the liver is not functioning properly many of these non-volatile acids coming from the intestines escape into the circulation and combine with the carbonates, etc., and so diminish the alkali reserve.

Again with a slight increase in acidity a still greater volume of CO_2 is eliminated, so that the reaction of the blood is still maintained at a constant pH, although the alkali reserve has been encroached upon by these acids. The practical outcome of this work is that the alkali reserve can be increased—

(1) By giving large doses of bicarbonates or sodium citrate by the mouth, or (2) By eliminating the amino-acids from the large intestine by saline purgatives, thereby altering the substrates towards the alkaline side and enhancing the action of the various alkaloids.

Sinton, following this idea, 1923, gave his malaria patients large doses of sodium bicarbonate or sodium citrate by the mouth, followed in an hour's time by quinine solution and found that his cure rate in malarial fevers was considerably increased in spite of the short duration of his course of treatment. Further the value of magnesium sulphate in combination with quinine is likewise explained by the elimination of the amino-acids from the large intestine. Knowles and myself have been using large doses of bismuth carbonate by the mouth in conjunction with emetine intramuscularly in amœbic dysentery, a method of treatment advocated by Deeks, with

very favourable results in spite of only a week's treatment. Within a couple of days the stools alter from a pH of 6.2 to a pH of about 8, allowing the emetine to act more powerfully. In a similar way the treatment advocated by Dale and Dobell by bismuth emetine iodide is explained—the bismuth emetine iodide is an insoluble compound and when it reaches an acid substrate such as the large intestine in amoebic dysentery the bismuth is set free and the whole of the emetine is available for action on the entamoebæ. This work opens up a very practical field of research in the treatment of two of the most important diseases that decimate the population of India. What we require to know is the mode of treatment of minimum duration associated with a maximum cure rate, the way has now been shown by the aid of these alkaline adjuvants. Such results can only be tested amongst a military population segregated in the hills away from any possibility of re-infection. The time is ripe for economy but the money spent in establishing such depôts where the problem can be thoroughly worked out will well repay Government, not only in its drug bill, but in the well being of the army and civil population of India.

H. W. ACTON

A NOTE TO CONTRIBUTORS

THE Editors wish to express their regret to several contributors, whose articles have been accepted as suitable for publication, at the delay which has occurred in publishing them,—a delay due to extreme pressure on our columns. A number of these papers deal with kala-azar, and it has consequently been decided to make the July number a special kala-azar number, with extra and additional pages. The number will however contain several papers on other subjects and it is hoped, by cutting down Current Topics and abridging reviews and the Annual Reports' columns to secure publication within the next three months of the papers now in hand.

"THE MEDICAL PROFESSION IN INDIA"

THE name of Major-General Sir Patrick Hehir, I.M.S. (retired), will be well known to our readers, his long and distinguished career in this country and during the war in Mesopotamia and in the Siege of Kut having brought him into touch with many members

of the different medical services in India. Sir Patrick is at present Medical Adviser in Greece to the British Red Cross Society, and has just published a book on "The Medical Profession in India." It is difficult to think of anyone better qualified to undertake such a task, albeit the book is one which can only command a limited sale, and which will appeal to only a limited class of readers. The book deals with the conditions of service in the various branches, the defects and merits of the systems, the changes effected and the recent developments in Indianisation of the superior service. The book is impartially written, and sections of it deal with the Ayurvedic and Unani systems.

At the moment of writing we have no further particulars of Sir Patrick Hehir's book, but it is undoubtedly one which will be of much interest to our readers, both from their knowledge of the author and from the subject dealt with. The author writes that he neither anticipates nor desires either profit or kudos from the book, but our readers will look forward with pleasure to its perusal.

Current Topics.

Leucoderma.

At an exceptionally interesting meeting of the Medical Section of the Asiatic Society of Bengal on the 11th April, 1923, a paper was read by Major H. W. Acton, I.M.S., in collaboration with Dr Ganpati Panja, Assistant Professor of Bacteriology, Calcutta School of Tropical Medicine, on the etiology and treatment of leucoderma.

The authors emphasised the great prevalence and interest of leucoderma in India. Apart from the erroneous lay belief that it is a form of leprosy, its cosmetic results were unfortunate, and in the case of young girls might prevent marriage. The statement in the text-books that it was rare under the age of ten was wrong—the majority of female cases seen in a year at the Calcutta School of Tropical Medicine being under that age. The disease is not infectious, there is no evidence of any hereditary tendency in connection with it, and as spontaneous cures frequently take place, it must be due, not to any destruction of melanoblasts, but to some alteration of their function.

The theory that leucoderma is due to deficient activity of the suprarenal glands may be dismissed at once—it is not accompanied by lowered blood pressure or other symptoms of adrenal deficiency. In fact when the adrenals are defective as in Addison's disease and kala-azar, there is a tendency towards bronzing or increased, in place of diminished, pigmentation.

The neurosis theory of leucoderma may also be dismissed. The lesions bear no relationship to any nerve distribution. Many leucoderma patients are, it is true, neurotic but the neurosis follows and is the result and not the cause of the leucoderma.

The commonly accepted view of melanin production by the melanoblasts is that they possess a secretory activity, and melanin is produced from amino-acids of the

aromatic series by the activity of a ferment, tyrosinase or dopa-oxidase. Block (1917) found the amino acid 3-4-dihydroxy-phenyl-alanine in the basal epithelium and hair follicles, and considered it to be concerned with melanin production.

Leucoderma being due, not to destruction of, but to diminished activity of the melanoblasts, two views of its etiology were to be considered —

(1) Do the melanoblasts in leucoderma secrete less tyrosinase? This appears to be the explanation of the white skin of Circassian races, and to occur as a congenital abnormality in albinism. In the leucoderma of syphilis, of leprosy and of certain ringworms, the activity of the melanoblasts appears to be directly depressed by the toxins produced. Once the specific remedies are given, and the toxins destroyed, the melanoblasts recover their activity.

(2) A second possible explanation of true leucoderma is that the supply of the necessary aromatic amino acids is deficient, although the melanoblasts may be still in full activity. This theory appeared to be the more probable one.

Melanoblasts are cells derived from the embryonic mesoblast and have no nervous connections. In the lower animals they are migratory cells. They have a close relationship to the cutaneous blood vessels, and their function is to act as a colour filter and to protect the delicate structures such as nerves and blood vessels in the dermis. With the appearance of the hairs and other dermal appendages their function is altered to pigment these structures. Man having lost the general hairy coat over the surface of the body, the melanoblasts are no longer required in the non-hairy areas to pigment hair and they migrate to the basal layer of the epidermis. The main stimulus to their activity is light. Leucoderma may be defined as a disease of the melanoblasts situated under the basal epithelium, and not of the melanoblasts of the hair follicles. The disease is characterised by the appearance of one or more round, oval or circumscribed patches of a milky white colour, which, when exposed to light, become pink. The patches tend to increase in size, and when stationary, exhibit hyper-pigmentation at the margins.

With regard to *etiology* the authors had analysed the statistics of 100 cases seen during 12 months. Seventy out of the 100 cases were less than 30 years of age and the age incidence varied from 4 to 52 years. Eighty-four of the 100 were males, the female patients being chiefly marriageable girls who wished to get rid of the blemish, and prostitutes. The majority of cases were drawn from the Bengali Hindu community, but five cases were seen in Europeans, and Mahomedans and Anglo-Indians also suffered from it. There appeared to be no special association with any particular diet. Of 100 cases 12 gave a history of some other member of the family being affected. Leucoderma is probably commoner in Bengal than in North India. Local irritation is apparently an etiological factor. Thus in the "dhoti" type the white patches are usually confined to the areas of maximum pressure of the loam cloth on the iliac crests. Several of the "melung" type of cases gave a history of syphilis. In out-patients examination of the stools was impossible but in the majority of cases seen privately there was chronic *E. histolytica* infection of the colon. Intestinal disorders and leucoderma seemed to be associated and an instance was given of brother and sister, both affected with leucoderma, the one having chronic bacillary and the other chronic amœbic infection. In Bengal the general *E. histolytica* infection percentage appeared to be from 8 to 10 per cent but in leucoderma cases it was much higher.

Clinically the disease always starts with a herald spot. Seventy-eight cases had definitely identified an initial lesion in 46 on the upper or lower extremities, in 16 about the face, in 8 on the trunk, 6 on the *dhoti* area, and in 2 on the genitalia. The single herald spot is usually followed by a similar spot placed symmetri-

cally on the other side of the body. The disease progresses by the development and coalescence of circumscribed milky-white areas. The affected skin is normal except for the pigmentary defect, the sweat and sebaceous glands are not affected in function and there are no subjective symptoms. The hair follicles in the leucodermic area are not affected and the hair usually retains its normal colour. Exceptionally, however, if the melanoblasts of the hair follicles are affected the hair goes grey or white as in a case shewn of a girl of 12. Leucoderma only affects the scalp very rarely.

Recovery usually takes place from the melanoblasts near the hair follicles. Hence in recovery there is seen a drift of melanin pigment towards the skin surface from the hair follicle roots and pigment is laid down at the points where the hairs erupt in a spotted manner. The disease has usually a symmetrical distribution.

Four clinical types may be recognised, (a) The melung type of Ziemann where the patches are symmetrically distributed on the palms or soles, and may extend up the forearms and legs. (b) The dhoti type, with oval patches on the iliac crests and with the condition usually limited to this area. (c) The mucocutaneous type with patches commencing at the mucocutaneous junctions around the mouth, nose, eyes, genitalia or arms. One case seen had leucoderma of the whole of the prepuce and glans penis, but nowhere else. (d) The diffuse type with lesions on face, hands, feet, trunk and groin. In such cases the patches may become pink during the hot weather or red from inflammation and a striking picture was shewn of a case with abdomen, shoulders and back mottled with large patches of red, acutely inflamed leucoderma. Very rarely indeed the whole body might become affected changing the appearance of an Indian into that of a Circassian but spots of pigment still remained here and there, and the condition could be differentiated from albinism by the fact that the hair and the iris retain their normal colour.

The disease (1) first appears in situations where the melanoblasts are least numerous, *e.g.*, soles, palms and mucocutaneous junctions. (2) It is closely associated with blood supply the melanoblasts of the hair follicles, where the blood supply is rich being usually unaffected. (3) The disease most commonly affects the extremities, and the lesions are most commonly seen around the nail roots. (4) Pressure and limitation of blood supply might explain the dhoti type and its localisation to this area. (5) The symmetrical distribution of the lesions suggests some central cause. How can these facts be best co-ordinated?

The melanoblasts are really of three types — (a) those of the hair follicles, (b) those under the basal layer of the epithelium, and (c) atavistic melanoblasts, which have no particular relation to blood capillaries, and, which if numerous give rise to freckles, or if associated with suppressed hair follicles, are associated with pigmented moles.

The depth of pigment in the skin is partly determined by heredity and is, of course, a racial trait. Even in complete albinism the melanoblasts are still present, although they produce no melanin. The atavistic melanoblasts, however, belong to the primitive pigmented vascular sheet and are cells uninfluenced by heredity and with powers of multiplication and migration.

On hydrolysis of proteids by strong HCl products are obtained which closely resemble true melanin in composition and in general properties. They are derived from the tyrosine and tryptophane of the proteid molecules, and like melanin, yield skatol, indol and similar derivatives when decomposed with caustic potash. The true composition of melanin is still unknown, but the dark areas of the skin exhibit oxidising properties towards the amino acid 3-4-dihydroxy-phenyl-alanine, which is closely allied to epinephrine. Sulphur may be present in various proportions, from 2 to 12 per cent, in different melanins but does not appear

to be an essential constituent. The melanins appear chemically to be heterocyclic compounds standing in some relationship to the indol nucleus, and tryptophane appears to be the mother substance of melanin.

The essential cause of leucoderma the authors regarded as being due to absence of the aromatic amino acids from which the melanoblasts produce melanin, by action of the ferment tyrosinase. These amino acids must come ultimately from the proteid elements in the diet. Leucoderma must in the ultimate analysis be due to either—(1) Faulty regulation of the amino acid metabolism. If this were so we would expect the chromaffin and adrenal cells of the suprarenal glands to convert pigmentary compounds, and with increased suprarenal activity, the blood pressure should rise. But it does not do so in leucoderma patients. Or—(2) Defective intake of the necessary amino acids. This appears to be the true explanation. The symmetrical lesions point to a central cause, the melanoblasts with the richest lymph supply are those least affected, the close association with *E. histolytica* infections suggests excessive destruction in the intestine of the amino acids concerned, perhaps in association with some change of the bacterial flora.

With regard to differential diagnosis true leucoderma should present little difficulty. Syphilitic leucoderma is, as a rule, asymmetrical, affects the neck and chest, and the Wassermann reaction may help in diagnosis. In leprosy the leucoderma is never complete, and other evidences of the disease are usually present. *Tinea albigena* generally starts on the soles and spreads up the legs. *Tinea alba* produces round circumscribed patches, covered with fine scales. In both conditions the skin is never completely depigmented, and mycelium and spores can readily be found in skin scrapings examined in formic acid.

Treatment—With regard to treatment it was still, frankly experimental. Differential diagnosis and the exclusion of the leucodermas due to syphilis, leprosy, burns, trauma and ringworm and their appropriate treatment was the first step. Vaccines had been tried by the authors, both staphylococcal with streptococcal, and of coliform organisms isolated from the patient's stools. Triglandulin tablets only appeared to increase the lesions, probably by stimulating the adrenal glands to use up the amino acids needed for melanin production. Spontaneous cures occurred not infrequently. With treatment by emetine hypodermically and Dimol as an intestinal antiseptic, considerable improvement had been noted. Lately the authors had been using *Bouché* (*Psoralea corylifolia*) giving the powdered seeds by the mouth and the expressed oil as a local application. But with the discovery of the true etiology of the disease the possibilities of successful treatment became much improved. The supply in some form or another of the proper amino acid for melanin production was indicated.

The paper was illustrated by a beautiful collection of colour plates and photographs, illustrating every phase of the disease.

In the discussion on Major Acton's and Dr Panja's paper Dr E. Muir asked whether the regeneration of the melanoblasts really came from the hair follicles. Major R. Knowles, I.M.S., congratulated the authors upon a most striking and brilliant contribution to the literature of a difficult subject. The etiological chain suggested was extraordinarily complete and to be able to break it at any link should supply the remedy for the disease. The condition appeared to be due either to deficiency of the supply of the right amino acids, or to interference with them by the adrenals, the latter factor possibly being under sympathetic control. Evidence of the wandering melanoblasts could be obtained in many animals. The chameleon has one side of its intestine pigmented. The livers of frogs and reptiles shew melanoblasts whilst he had also found them in liver smears from a zebra from the Zoo. The suggestions with regard to the rôle of *Entamoeba histolytica* were interesting. We knew much about the morphology of this parasite, but little about its bionomics and the

end products of its tissue-lytic activities. The Charcot-Leyden crystals, which, as Major Acton had pointed out, are especially associated with *E. histolytica* infections are the results of decomposition of amino acids. He trusted that, despite the now prevalent difficulty of securing early publication in India of any medical paper of outstanding interest the paper would shortly be published. Lt-Col J. W. D. Megaw, I.M.S., thanked the authors on behalf of the Society. In reply Major Acton pointed out that recovery in leucoderma was associated with a drift of the melanoblasts from the neighbourhood of the hair follicles towards the surface of the skin and therefore the re-pigmentation first appeared at these spots. The sympathetic could control the adrenal activities, possibly even the supply of aromatic amino acids to the melanoblasts, but could not control the atavistic and wandering melanoblasts which were not subject to nervous control.

Acute Streptococcal Gastro-enteritis.

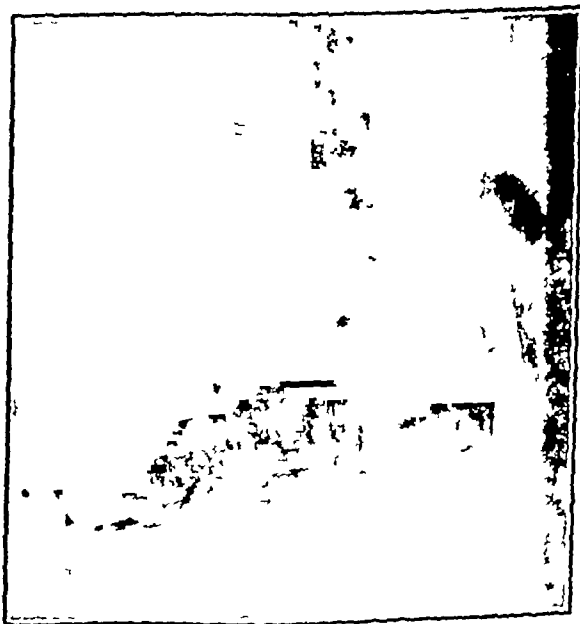
DR. SHIAN MANOHER LAL, Civil Surgeon, Bulandshahr, sends an interesting account of four cases of acute gastro-enteritis, apparently due to streptococci, and simulating cholera. All occurred at the end of November, when true cholera is rare in the district. The first patient, when seen, was pulseless and presented the typical picture of cholera. There was suppression of urine, but the stools were atypical. No cholera vibrios could be isolated and no cholera red reaction obtained. The patient died. At the post-mortem examination the small intestine was found to be intensely congested with necrosis of much of the mucosa. Smears from the stomach and gut contents shewed innumerable chains of Gram positive cocci.

Two days later the author was called in to attend a similar but less severe case. A few days later two cases occurred in the jail, which is situated inside the city. All three cases recovered, and all shewed innumerable chains of Gram positive cocci.

Bulandshahr does not trench its night soil, which is deposited almost fresh upon the fields, and the author suggests that these cases were gastro-enteritis due to streptococcal infection, and that flies, which were abundant at the time, were responsible for the outbreak. (Abstract from original communication.)

Mycetoma Infection in Coorg.

LT-COL E. C. C. MAUNSELL, I.M.S., records the history of what is apparently the first case of mycetoma



infection recorded in Coorg. The patient was a Kuruba coolie, aged 50, born on a coffee estate at Polli-



"Progress" ?

THE painful crisis which has arisen in connection with the Medical Research Department as the result of the drastic recommendations of the Inchcape Committee has so preyed upon the feelings of an esteemed correspondent that mere print will not convey them,

and we are indebted to him for the above delightful cartoon. We may add that the artist is an Indian and a distinguished member of the threatened department. He has also submitted a second sketch of the scene after the shipwreck, but, at present at least, we forbear from publishing it we trust that matters will not come to that.

betta at an altitude of approximately 3,000 feet, and had never left his home since birth. Two years before admission to hospital he noticed a small swelling on the arch of the sole of the right foot, which finally burst and left a sinus. Further abscesses and sinuses appeared during the next two years and, on admission to hospital, the right foot was riddled with the infection, as shewn in the photograph. The natural arch of the foot was filled up and the sole of the foot convex with the swelling instead of concave. The toes were bent upwards and did not touch the ground when the foot was placed flat on the ground. A number of sinuses were present, some superficial, but others leading down to bone. The condition was painless, but the weight of the foot caused discomfort.

The patient refused to permit operation or even the scraping of a sinus for diagnostic purposes, but the condition was apparently mycetoma, and the infection has not previously been recorded in Coorg. (*Abstract from original communication*)

Retro-Pharyngeal Abscess Simulating Bezold's Mastoiditis

CAPTAIN G. D. KAPUR, Civil Hospital, Delhi, records an interesting case of difficult diagnosis. The patient was an adult male, about 45 years of age, with an infiltrated, brawny swelling under the upper part of the left sterno-mastoid, extending right up to the tip of the mastoid process and accompanied by a very profuse discharge from the ear. There was pain, tenderness, and œdema over the mastoid area, and the patient appeared ill and exhausted from septic absorption.

The diagnosis of chronic suppurative otitis media with mastoid abscess having been made, Colonel Jeudwine operated. The antrum was opened and the bone was found to be almost ivory hard with no evidence of caries, sinus or inflammation. A big cavity found near the tip of the mastoid process however was found to be coated with a thick purulent membrane. The tip of the mastoid process was chiselled off and still pus was not struck, although it continued to pour out from the external meatus whenever pressure was made over the upper part of the sterno-mastoid.

A counter opening was now made at the angle of the jaw, and on exploring with the finger a huge abscess cavity was discovered, extending right up to the cervical vertebrae and draining through the external auditory meatus.

The author comments that retro-pharyngeal abscesses may extend beneath the sterno-mastoid, but they rarely cause symptoms suggestive of a mastoid abscess, whilst rupture through the external auditory meatus must be of very exceptional occurrence. Drainage was established through an opening behind the angle of the jaw and the subsequent course of the case was uneventful. (*Abstract from original communication*)

Traumatic Rupture of the Small Intestine.

DR L. W. HEFFERNAN, M.R.C.S., L.R.C.P., Chief Medical Officer to the Burma Corporation and Surgeon to the General Hospital, Namtu, records the history of a Chinese coolie who was wheeling a barrow full of lead-silver ore at 9 p.m., when the front of the wheelbarrow struck against a post, with the result that the handle was driven against his abdomen with considerable force. The patient finished his shift and then went home. Next day he complained of severe abdominal pain and was brought to hospital at 4 p.m.

On admission the abdomen was as rigid as a board, temperature 101.8, pulse 120, respiration 40. The abdomen was opened through a right rectus incision, and peritoneal fluid and intestinal contents immediately escaped. Acute general peritonitis was present, and the jejunum was found torn about three feet distal to the duodeno-jejunal flexure. Whilst examining for the site of the lesion several *Ascarides* were palpated through the wall of the small intestine. The tear in

the jejunum was sutured, the peritoneal cavity mopped out with normal saline, a drainage tube inserted in the wound and another through a supra-pubic puncture. The patient's temperature dropped to normal on the third day after operation and he left hospital in good health on the 31st day. The wound healed by primary union except in the region of the drainage tube.

This excellent result, despite the long interval between the time of injury and operation, and the vitality shewn by the patient are of interest. (*Abstract from original communication*)

The Failure of Antimony in Malaria.

THE question having been raised some years ago as to whether intravenous injections of tartar emetic might not have some effect upon the malarial parasites, the method was adopted by—probably—many practitioners in Bengal. Its failure in malaria was strikingly illustrated by the case reported by Colonel Greig, where a patient with an oriental sore being treated by a full course of intravenous antimony developed a sharp attack of malaria whilst under antimony treatment. DR A. RASHEED, M.B., of Monghyr, reports the case of a patient with fever and enlarged spleen who was first treated by a hakim and later fell into the hands of a therapeutic enthusiast who, without establishing the diagnosis of kala-azar, put the patient on to intravenous injections of antimony tartrate on alternate days. Despite the injections the fever increased; it shewed tertian remissions; temperatures of 103 degrees to 104 degrees F. occurring on the non-injection days, with rigors and increasing exhaustion. The spleen continued to increase in size.

When the patient came under Dr Rasheed's care the spleen was enlarged to six finger breadths below the costal margin. The aldehyde test gave negative results; there was no leucopenia and blood films shewed abundant benign tertian malarial parasites. The patient had had 13 injections of antimony without the slightest effect upon either parasites or clinical symptoms. Quinine and arsenic were now administered orally and the patient has now been in excellent health for the past eight months. The antimony treatment, if anything increased the severity of the disease. Dr Rasheed is to be congratulated on establishing a correct diagnosis, instead of merely relying on clinical symptoms, and on a useful contribution to the literature. (*Abstract from original communication*)

The Treatment of Tubercular Adenitis with E.C.C.O.

MAJOR J. L. SEN, M.B., M.C., D.M.R.E. (CANTAB), I.M.S., reports on the value of E.C.C.O. in cervical tubercular adenitis, a condition which it is difficult and sometimes even dangerous to extirpate by surgery, and even more difficult to treat efficiently by medicinal measures. "E.C.C.O.," as we need hardly remind our readers, is a preparation consisting of the ethyl esters of chaulmoogra oil, with comphor, creasote and olive oil, introduced by Dr Muir for intramuscular and subcutaneous injection in leprosy.

Major Sen's patient was a Gurkha, 20 years of age, admitted to hospital at Kohima on the 15th September, 1922, with tubercular adenitis of the cervical glands of eight years' duration. Sinuses led to purulent and breaking down glands in both axillae, as well as in the neck. The patient had irregular fever, and was unable to move his head from side to side, and to lift his arms above his shoulders. The sub-maxillary area, all triangles of the neck and both axillae were involved, and there were extensive areas of keloid scar formation.

Treatment was commenced on the 4th of October, with ½ cc of E.C.C.O., the dose being increased by ½ of a cc every fourth day. There was no reaction to the injections. The ulcers and sinuses were dressed with antiseptic dressings. By the 24th October the

dose had reached 1½ c.c. After a dose of 2 c.c. was reached the patient made a steady recovery. By the 12th December the dose had been increased to 4½ c.c. The patient had now no pain or stiffness, all ulcers and sinuses had healed up, and no enlarged glands could be felt in either axillary or cervical regions. He could move his head freely from side to side and could raise both arms vertically above the shoulders.

Major Sen's results in this case are very striking, and he appeals to other workers to try the treatment with E.C.C.O. experimentally and to publish results (*Abstract from original communication*)

A Barbarous Custom

DR. NALIN BEHARI GHOSAL, M.B., Konnagar, Hughly district reports a fatal case of death from respiratory failure after confinement. The patient was a Hindu primipara of only 12 years of age. On the onset of labour the "dai" in attendance had tied a cotton band very tightly around the waist at the level of the umbilicus with a view to 'preventing the foetus from rising above the level of the umbilicus.' The constriction remained on for two hours, when it had to be removed owing to the patient's distress.

The case was seen by Dr. Ghoshal four hours after the onset of labour. Complete rest and a diet of barley water and citrated milk were ordered. During the night the patient gave birth to a living female child. Immediately afterwards dyspnoea supervened, with a respiration rate of 60 per minute, a running pulse cyanosis, and intense thirst. The placenta was expelled by natural means and was found to be intact. There was no post-partum hæmorrhage. Adrenalin was given followed later by pituitarin and ergot, and hot fomentations applied to the extremities, which were very cold. In two hours the dyspnoea passed off, and an hour later the patient fell into a natural sleep.

There was a slight degree of fever for the first two days of the puerperium, but for the next ten days the patient appeared to be progressing favourably. On the twelfth day however fever and rigors set in. On the fourteenth day a consultant was called in from Calcutta, and the uterus was explored. The lochia were now offensive serous in character and contained fragments of clot. Dyspnoea again supervened, a temperature of 102 pulse 150 respiration rate 45. The lungs shewed no evidence of disease throughout. The patient died on the fifteenth day after delivery.

Death appears to have been due to septicæmia, and possibly the "dai" did more than tie the band around the patient's waist. Dr. Ghoshal also describes a second case where the patient was a Mahomedan multipara of low caste. Placenta prævia was present, with prolapse of a hand. Internal version was advised and was carried out by an experienced quack midwife, who took no aseptic precautions and whose hands were lubricated with bazar castor oil. A dead female child was delivered, and despite the exposure to sepsis the patient made an uneventful recovery. The author comments on the fatal outcome in the first case where there was no special evidence of exposure to sepsis, and on the favourable outcome of the second case where the patient had been exposed to gross sepsis. (*Abstract from original communication*)

A Case of Urticaria due to food Sensitiveness

SUB-ASST. SURGN. BISHNU CHARAN MAZUMDAR, in charge of the Jail Hospital, Gauhati, reports the case of a male convict, 21 years of age sentenced to transportation for life who suffered for four months after admission to jail with intense and troublesome urticaria. He appeared to be otherwise healthy. Calcium chloride chologogues salines bismuth carbonate, and 'gerumati'—a kind of earth sold in the bazar for colouring the clothing of monks and fakirs,—were all tried without results. The patient was on the ordinary jail diet of dal vegetables, tamarind chutney and

bi-weekly fish curry. At the suggestion of Major Batra, M.C., I.M.S., the Superintendent of the jail, the diet was now changed and ground wheat and curd substituted for rice and fish curry, and all medicines stopped. Within a week all urticaria had disappeared and the patient has now been free from all symptoms for more than a month. (*Abstract from original communication*)

How long can a Foetus Live after Prolapse of the Hand?

DR. R. S. TEMBE, I.M.S., Kalyan, reports an interesting case with reference to the above question. The patient was a 4 para aged 30 whose previous labours had been normal. Labour commenced at full term at 9 p.m. one evening. A doctor who was called in next morning found prolapse of the hand. The patient was brought to hospital at 4 p.m., 15 hours after the onset of labour. She walked from the railway carriage in which she travelled a distance of about a hundred yards to a carriage outside the station.

On admission her temperature was 100 degrees F, pulse 130, tongue coated, and uterine contractions present but weak. She was anaesthetised and the genitalia cleaned. On examination a vertex presentation was found with prolapse of the left hand by the side of the head. No foetal heart sounds could be heard. The hand was replaced, long forceps applied and traction made. After repeated efforts however no progress could be made. The patient being in an exhausted state and no foetal heart sounds having been heard, it was concluded that the child was probably dead, and the head was perforated and delivery effected. To the dismay of the medical attendant the foetus was found to be making convulsive efforts at breathing which continued for over ten minutes.

The patient had slight fever for seven days, but made an uneventful recovery. (*Abstract from original communication*)

Intravenous Iodine in Tubercular Adenitis.

SUB-ASST. SURGN. K. DALEPPA, I.M.P., Khajuripara Khondmals, Orissa, records the history of a boy of nine with enlarged tubercular glands in the neck and axilla of the right side. Almost all the glands in the posterior triangle of the neck were enlarged, and both the neck and right axilla were riddled with sinuses and shewed much scar tissue. The patient was very thin and anæmic, with an enlarged spleen and an evening rise of temperature.

For the first five days after admission the ulcers and sinuses were dressed with perchloride of mercury compresses and syrup ferri iodide given orally. Intravenous iodine was then resorted to, the first injection being 6 minims of tinct. iodin in 2 c.c. of distilled water. The next day 10 minims were given in 5 c.c. of distilled water. There was now distinct improvement in the clinical condition, and fever had stopped. Saline compresses were substituted for perchloride ones. Four days later 15 minims of tinct. iodin were given in 5 c.c. of distilled water, and the same dose repeated the next day. The patient was now much less anæmic, the spleen had become smaller in size, and only a small, indolent ulcer remained in the axilla. At this stage the patient left hospital of his own accord. (*Abstract from original communication*)

Extract from a discussion on the Diagnosis and Treatment of Cholelithiasis read at the Annual Meeting of the British Medical Association

By RUTHERFORD MORISON, F.R.C.S.,

Emeritus Prof. of Surgery, University of Durham,
B.M.J., November 25, 1922, p. 1005

In 1895 Rutherford Morison concluded that the pain of gall-stone attacks is due to the presence of a

stone and cholecystitis. Neither stone alone nor distension alone causes contractions of the gall-bladder, which are the cause of the painful attacks.

"Painful spasms" commencing in the epigastrium are the earliest symptom of gall-stone. "When the gall-bladder is distended without jaundice, and pain after the first acute attack is absent, a stone has completely blocked the mouth of the gall-bladder or the cystic duct. Such a gall-bladder can continue as a painless swelling for weeks or years if its mucous membrane does not become infected."

"Attacks of severe pain in the epigastrium and right hypochondrium, accompanied by vomiting and shivering and followed by sweating, complete relief, and transient jaundice, are due to the passage of a gall-stone from the gall-bladder through the ducts into the duodenum."

"If relief after the pain is incomplete, the jaundice more or less persistent, and the patient every now and again attacked by ague-like paroxysms, with or without pain, each attack being followed by a temporary increase of jaundice, a stone is impacted in, but not completely blocking, the common duct."

There is only one subjective symptom on which a diagnosis of gall-stones can reasonably be based and that is pain—but it must have special characteristics. It should be severe, often so sudden in onset as to be compared to a stab, lasting only a few moments in some cases, in others for hours, referred to the epigastrium, catching the breath before inspiration is complete, and on its cessation leaving the patient entirely well. It is frequently followed by vomiting and is called "indigestion."

A tender area over the gall-bladder on deep palpation during forced inspiration, discovered during the attack and lasting for a time after it forms the grounds for a diagnosis of gall-stones and will be correct in eight cases out of ten.

When all stones have escaped from the gall-bladder into the common duct, attacks of pain, but less violent, still usually occur.

Of the signs of cholelithiasis a gall-bladder tumour or jaundice preceded by a typical attack of pain are clinical guides that seldom fail. In 29 out of 30 cases the gall-bladder tumour is due to obstruction by a large stone, in 18 out of 20 cases the pain and jaundice are due to a stone into the common duct.

There is only one reasonable treatment—namely operation. Recurrences are frequently due to stones left behind.

Cholecystotomy is the best operation when the cystic duct is patulous. The author never closes the abdomen entirely but leaves a small tube drain in the hepatic pouch.

If the gall-bladder be seriously infected it should be opened freely, the stones removed and its interior carefully inspected, unless it is so obviously pathological that recovery seems impossible it should have the benefit of the doubt.

If the gall-bladder is so much diseased that its recovery seems impossible it may be dealt with by cholecystectomy or the thermo-cautery. Cholecystectomy is not the operation of election in gall-stone cases. It is likely that a new form of hepatic cirrhosis is now in course of development since the surgical craze for cholecystectomy has become widespread.

II—By FARQUHAR MACRAE, M.B.,
Surgeon, Western Infirmary, Glasgow

In the course of his address the author discussed the differential diagnosis between gall-stone colic and other painful conditions of the abdomen. The character of colic, coupled with the site of the pain under the right costal margin, radiating to the back, and the tenderness in the same situations usually make the diagnosis one of little difficulty, especially if the gall-bladder is palpable even under the rigid upper right rectus. The only conditions which could stimulate it are perforation of a pyloric or duodenal ulcer, renal colic from stone or from infection with *B. coli*, appendicitis, acute pancreatitis, or pancreatic calculus. In hepatic colic

the muscular rigidity is limited to an area corresponding to the inflamed peritoneum and gradually fades as one tests it by moving the pressure away from the area implicated. The patient does not lie quiet and resent movement, but tends to toss about seeking relief to his distress. Vomiting is likely to be repeated in hepatic colic. The pain is characteristically colicky in hepatic colic.

The main features which characterise the indigestion of gall-stones are three in number. First, it is not materially affected by variations in the character of the food ingested; secondly, it is constantly present over long periods, and thirdly, it does not recur regularly at a stated interval after meals but tends to be variable in the time of onset and may occur through the night.

No medical remedies can cure gall-stones, but they do not in all cases demand operation. The great majority of the victims suffer only from indigestion and it is doubtful whether the surgeon is justified in urging operation on them. Repeated attacks of colic are a good ground for urging operation. It seems to be very open to question, in view of the enormous number of people who possess gall-stones, whether the total number of those who would die if all these were to be operated on, would not be greater than is the case with the adoption of less strenuous surgery.

The Abortive Treatment of Syphilis and Salvarsan Research in Germany.

B. M. J., October 21, 1922 p. 768

PROFESSOR KOLLE, on whom the mantle of Ehrlich has fallen, has been engaged for a considerable time in studying the effects of salvarsan on experimental syphilis in rabbits. The two questions he set out to answer were (1) Is it possible, and, if so, in what percentage, to sterilize with salvarsan rabbits infected with syphilis? (2) At how late a stage after infection is sterilization feasible? Kolle agrees with Finger, Landsteiner, Uhlenhuth, and others, that once a rabbit has been infected with the Truffi strain of the *Spirochæta pallida* it is immune for the rest of its life. This immunity to re-infection from without in the form of a typical primary chancre is conditional on its not having been given any anti-syphilitic treatment, and on ninety days or more having elapsed since the first infection. Among the many hundred rabbits he has inoculated he has not seen a single exception to this rule, although in a few cases he has observed a typical infiltration or ulcers, containing spirochætes, at the site of a second inoculation. Within the first sixty days of the first infection he has been able to induce re-infection in 50 to 60 per cent, and he has achieved this result in a few instances between the sixtieth and ninetieth days. Within 3, 15, 20, 25, 30, 45, 60, 90, and 120 days of the first infection rabbits were given three large doses of salvarsan preparation and attempts were made 110 to 120 days after the first infection to induce a typical chancre by re-infection. Various salvarsan preparations were used, and neo-silver-salvarsan figures most prominently in Professor Kolle's tables. Changes were also rung with mercury in combination with salvarsan, and the development of a typical chancre after re-infection was accepted as evidence of effective sterilization of the tissues after the first infection. It was found that when this sterilization was attempted within the first forty-five days of infection complete recovery occurred in a considerable percentage, whereas after the forty-fifth day this was the exception. In no single instance in which salvarsan was administered after the ninetieth day did a typical chancre develop when an attempt was made to re-infect. There is thus weighty experimental evidence in support of the clinical finding that the success of salvarsan medication depends largely on the interval between infection and treatment being short, but it is, of course, doubtful whether the forty-five day limit in the case of the rabbit can be accepted as the

"sterilization limit" for man. Another interesting observation made by Professor Kolle was that the combination of mercury with salvarsan did not add to the number of his successes, and he claims that this is in accord with clinical experience. The dosage of salvarsan recommended by Professor Kolle for man is 0.45 gram of neo-silver salvarsan, 0.3 gram of silver salvarsan, or 0.5 to 0.6 gram of neo-salvarsan, these doses being approximately two-thirds of what he calls the *dosis tolerata*. He also recommends the injection of a precautionary dose of 0.05 gram of salvarsan twenty-four hours before the main injection is given, and the addition of a 40 per cent. solution of sugar (glucose) to the salvarsan. It will be seen that Professor Kolle has reverted to his predecessor's scheme for a *sterilisatio magna*, although he does not use this term in his paper, and he recommends not one but three to four large injections. He doubts whether the percentage of biological cures can be appreciably increased by a greater number of injections. Investigations are proceeding in his laboratory in connexion with the therapeutic possibilities of prolonged and intermittent treatment of fully established syphilis with salvarsan alone or in combination with mercury, but they are not sufficiently advanced to allow any conclusions to be drawn from them. With regard to the early abortive treatment of syphilis with large doses of neo-silver salvarsan, however, he is very optimistic.

Treatment of General Paralysis of the Insane by Inoculation with Malarial Parasites and Spirochætes of Relapsing Fever

By P. MUHLENS

and

W. KIRSCHBAUM,

(*Zeitschr. f. Hyg. u. Inf. Krankh.*, Band 94, page 1, 1921)

IN view of the interest of the work which has recently been done on the continent of Europe on the treatment of late syphilitic lesions of the brain by infecting the patient with malaria and relapsing fever the following abstract is given.

The treatment is safe in early cases but must be under control. Advanced cases are not suitable. All three types of malarial parasite and *Spirochæta recurrentis* are inoculable. *Plasmodium vivax* underwent twenty passages without loss of virulence.

The incubation periods after subcutaneous inoculation with infected blood were—

<i>P. vivax</i>	5–29 days	(10–19 days)
<i>P. malaria</i>	15–50 "	(30–36 ")
<i>P. m. maculatum</i>	7–14 "	
<i>Sp. duttoni</i>	3–8 "	

The clinical symptoms were the same as in natural infection but were milder, and progressive anaemia was the most pronounced feature. The spleen was enlarged only in 25 per cent. of the malarial cases and in 33 per cent. of the relapsing fever infection. Malarial infections yielded readily to quinine in doses of eight grains daily for 12–16 days. There was no relapse. Some cases of malignant tertian and quartan showed resistance even to fifteen grain doses. One quartan case yielded to methylene blue treatment after quinine in fifteen grain doses daily had failed. Parasites in different persons from the same source showed variation in resistance to quinine so that the resistance depends on individual peculiarities and not on the strain of the parasite. The native *Anopheles maculipennis* was capable of being infected with cresscents in the winter season even during quinine treatment. The anatomical lesions of the brain and spinal cord due to G. P. I. did not show any definite changes resulting from treatment.

Seventy-six cases of G. P. I. were treated in Hamburg for 2½ years. Of these 51 cases were observed

one year after treatment by malaria inoculation and with relapsing fever, 37 showed definite improvement, fourteen were able to resume full work, sixteen were slightly defective and seven were capable of work but were mentally defective. Recent cases under a year yielded more readily. Some regard the improvement as being due to proteid shock, others attribute it to high temperature.

The Properties of Certain "Colloidal" Preparations of Metals

By A. J. CLARK, M.C., M.D., F.R.C.P.,

(From the Pharmacological Department, University College, London)

Brit. Med. J., Feb. 17, 1923, p. 273

THE author at the invitation of the *British Medical Journal* investigated the properties of certain of the colloidal preparations advertised. The preparations investigated were certain of the collosols and of the oscols. The preparations were bought in the open market, but care was taken to ensure that they had come recently from the manufacturers.

The whole of the metal present in oscol ferrum and oscol argentum is in a colloidal form, and it does not pass into true solution on exposure to the air. Collosol antimonium and arsenicum and oscol arsenicum and stibium all appear to contain a mixture of colloidal and non-colloidal metal, but on exposure to the air the metal tends to pass into true solution. Very little of the quinine in collosol quinine appears to be in colloidal form, and no demonstrable quantity of the iron in collosol ferrum appears to be in colloidal form.

Collosol Iodine—Collosol iodine consists essentially of an aqueous solution of iodine with sodium chloride and gelatin.

The quantitative composition was found to vary in three bottles purchased on different occasions, but in no case was the iodine found to exceed that which could be dissolved by water containing the sodium chloride alone without the gelatin. The iodine, therefore, is present in the form of a plain aqueous solution of simple character, the addition of gelatin is without influence on its molecular nature or activity. Therefore the iodine is in no sense colloidal, nor indeed is there any colloidal quality in the preparation except the colloidal attribute of the dissolved gelatin.

Collosol iodine is, of course, very unlikely to cause iodism, for a litre of collosol iodine only contains six grains of iodine (free and combined), and the dose recommended by mouth of collosol iodine is from two to eight c.c.m.

Cawston and Wildish claim to have cured leprosy with oscol stibium and the total quantities of the preparation which they found effected a cure varied from 15 to 40 c.c.m. These results are very remarkable, for 40 c.c.m. of oscol stibium only contains 0.02 gram (1/3 grain) of antimony, and the quantity of antimony found necessary to produce cures in other diseases has been from 5 to 40 grains. Rogers, who used colloidal antimony sulphide, recommended 2/3 grain antimony intravenously as a single dose.

Collosol and oscol arsenic and antimony were nearly as toxic as non-colloidal solutions on intravenous injection, but the former was about one-half as toxic as the latter on intramuscular injection. The results with intramuscular injection may be due to the organic matter in the colloidal preparations hindering absorption. These results confirm the conclusion that a considerable proportion of the arsenic and antimony present in these preparations is in true solution, and suggest that the remainder is rapidly converted in the body into true solution.

The trypanocidal action of these substances was tested upon mice infected with *Trypanosoma equiperdum*. Tartar emetic was found to be superior to either collosol antimonium or oscol stibium as a trypanocidal agent, and there was no pronounced difference

supply, but improvements in conservancy should next be undertaken. The birth-rate for the year was 20.20 per mille and the death-rate 43.08, the latter a high figure even for India. Labour and industrial unrest and the work of the non-co-operative movement have played their part of recent years, and the year saw a strike on the part of the conservancy menial staff, and in Asansol and Raniganj conservancy measures were only carried on with difficulty. The need of the Cossipore-Chitpore municipality for an improved water-supply is essential, whilst the delay in bringing the project for the Grand Trunk Canal scheme to a head is holding up improvement schemes in the drainage of Maniktala, Cossipore-Chitpore and Dum-Dum. The Commissioner of Khulna observes that bad administration is too often at fault owing to failure of the executive to make full use of their powers of coercion under the Act. "Though the main difficulty is want of money, the result for money spent is, in defect of proper supervision, not always the best. Without the growth of a strong public opinion supporting sanitary measures and vigorous control there can be no marked improvement under present conditions. Nor do I see signs of any new spirit looking for a leader to carry broader views into effect. Even if a committee does not dare to face the capital outlay, I find no bias in favour of private enterprise in matters of public concern." It is a statement which might well be reduplicated all over India—with a few honourable exceptions. Everywhere in India one meets with the same spirit: municipal apathy, insufficient funds, disinclination to interfere with the established and insanitary order.

"Kurseong has a piped water supply, and its sewerage scheme is nearing completion. Its lighting is poor, its market in a congested locality, its arrangements for the slaughter of cattle and for the sale of meat are most defective, its surface drainage bad, and the majority of its houses have grave sanitary defects. The income of the municipality is insufficient to finance an adequate loans programme." In a public health sense India remains as yet utterly somnolent.

In Calcutta Corporation matters are, of course, much better. The year saw the institution of 114 prosecutions for adulteration of ghee, based on examinations of 752 samples, and 50 convictions, with fines amounting to Rs 10,575. Much unwholesome foodstuff was destroyed at Howrah before it could be imported into the city for sale, whilst the new milk block in the Sir Stuart Hogg market would do credit to any English municipality, as anyone who has visited it knows. Steady improvements are in progress in both the water supply and in the main sewerage and a serious attempt is being made to replace the terrible insanitary "municipal railway" (to use a euphonious term) on Lower Circular Road with its train loads of openly exposed refuse, by motor lorries. The removal of this railway would add much to the amenities of the city.

The expenditure by District Boards on medical relief and public health measures totalled Rs 11.7 lakhs as against 10.5 lakhs in the previous year. 22 new dispensaries were laid down during the year, and temporary dispensaries opened in Birbhum to combat epidemics of cholera and malaria. Cholera remains, as usual, the scourge of the Bengal mining areas, and the best method of dealing with it awaits the solution of the problem as to whether the local epidemics are of local origin or arise from infection imported from Puri and other pilgrim centres. The report urges the adoption of cheaper dispensaries in the mofussil, and the utilisation of existing buildings in place of standardised and expensive new buildings. In Khulna voluntary anti-malarial leagues were instituted, whilst in other towns selected medical practitioners were subsidised to visit schools, give lectures, and attempt to arouse public interest. In Howrah an anti-cholera experiment was tried: six sanitary inspectors were placed in six thanas with a sub-assistant surgeon in charge and the Health Officer in control. They were provided with bleaching powder, hycol, cholera literature and posters. The death rate from cholera has, as a result, been appreciably improved. In the matter of vaccination the

addition of women vaccinators to vaccinate *pardanashis* women is a notable advance. On the whole it must be said that the District Boards in Bengal are far more wideawake to their duties and responsibilities in matters of public health than are the Municipalities, but they are seriously hampered by the omnipresent want of funds. Yet it should not be beyond the wit of the legislature to devise new sources of revenue which would yield the requisite funds without undue taxation.

Water-supplies constitute a serious problem in the deltaic areas of Bengal. To some extent tube wells afford a solution, but here and there—for unexplained reasons—they are not satisfactory. In spite of the official suggestion made by Government that District Boards should consider the provision of water-supplies as capital works to be financed by loans, the entire expenditure on them was met from current revenue. In this and similar matters there lies perhaps an opening for the public-spirited capitalist which might return a paying dividend and at the same time immeasurably improve public health.

The cinchona plantations and factories were active throughout the year, 3,236 acres were under cultivation and 617,000 lbs of indigenous mixed bark were worked up at the Government Factory as against 484,245 lbs in the previous year. The total provincial quinine reserve stood at 39,832 lbs at the end of the year, and the value of the stock in hand at Rs 13,11,392. This activity of government is at least doing well, if not handsomely.

Turning to factories and industrial legislation the year was marked by labour unrest due to the non-co-operation movement. The general health of factory operatives was satisfactory. Managers are almost universally noted as doing their utmost to improve coolie lines, water-supplies, conservancy and the health of their employees. In fact Bengal in this respect will stand very favourable comparison with the cotton mills of Bombay or any other Indian Presidency. New legislation and increased hours of rest have been cheerfully accepted by the industries concerned, and in their care for their labour forces the leaders of the great industries of Bengal can claim all credit.

Chapter 6 of the report deals with vital statistics and the medical services. The aftermath of the influenza pandemic has been more severe in Bengal than in other Provinces of India. Its effect is shewn, not so much in an increased death-rate, as in a diminution of the natural increase of population, Bengal—with an excess of deaths over births of 27 per mille in this respect—being head of the list for India. Only eight districts shewed any excess of births over deaths. The provincial birth-rate was 30.0 per mille, and the death-rate 32.7 per mille. Maniktala recorded a death-rate of 54 per mille, Kurseong one of 48.8, and Birbhum and Darjeeling one of 43.7 and these figures may be read in the light of what has previously been said about their sanitary state. The death-rate is appreciably higher among Mohamedans than amongst Hindus, 5.9 per mille higher. Infant mortality is still at a high figure, 207 per mille, and Maniktala succeeded in recording a rate of 896 per mille but this is probably due to defective registration if it were literally true the municipality should be closed down at once. An enquiry into the accuracy of the birth and death-rate returns in Jalpaiguri and Pabna detected errors of 20.3 and 17.7 per cent respectively, and any vital statistics for India should be accepted only with the greatest reservations. "the law in regard to registration of births and deaths is practically a dead letter in the majority of municipalities."

Cholera was present in every district, but was on the whole far less prevalent than in the previous year, 54,199 deaths as against 70,750 in 1919. December was the month of highest cholera mortality. "unfortunately local authorities are very adverse from taking the necessary measures in prevention. The most serious outbreaks occurred in towns. Municipal authorities and district boards as a whole remain in general very

apathetic in regard to cholera prevention," states the report.

Fever mortality was high, 1,144,421 deaths as against a previous quinquennial average of 1,088,794. March, April, May before the rains, and August, October and November after them are noted as the worst months. Burdwan and the Presidency divisions were especially concerned and—in view of the serious prevalence of kala-azar in both—one cannot refrain from asking to what extent kala-azar is responsible for these figures. The ratio of fever cases to total admissions to the dispensaries in general, or "fever index," shows a very material increase in recent years, an increase of 40 per cent in the Presidency division, 25 per cent in Burdwan, 46 per cent in Rajshahi, and in Dacca and Chittagong, which have for long been regarded as relatively free from malaria, increases of 91 per cent. and 146 per cent. respectively. Is this, we repeat, due to the spread of endemic—(and now perhaps in some places epidemic)—kala-azar?

The interested reader of this report will have to delve for the different items of medical interest, but, taken as a whole he will find that they shed a strong and penetrating light upon general public health problems in Bengal in particular and in India in general. Progress, however, may everywhere be noted and, if we may be permitted to mention one factor at least, which did much to contribute materially to such progress it was the deep and personal interest in all problems of public health and welfare in Bengal taken by the late Governor of the Presidency, Lord Ronaldshay.

ANNUAL REPORT FOR THE YEAR 1921-22 ON SANITATION, DISPENSARIES, AND JAILS IN RAJPUTANA—By LT-COLONEL J W WATSON, I.M.S., OBTAINABLE FROM THE SUPER-INTENDENT, GOVERNMENT PRINTING, INDIA, CALCUTTA. PRICE, Rs 2-12

THIS report contains several items of interest, although the information given is chiefly in statistical form. The rainfall for the year was rather defective, and the general death-rate 28.41 per mille as against 25.71 in the previous year. The birth-rate on the other hand was increased, 31.13 per mille as against 27.77 per mille for the previous year. Influenza and pneumonia were still rather prevalent, and an epidemic outbreak occurred in Kotah city in January-February, with 377 cases and 153 deaths. Relapsing fever having also broken out in the same State a small dispensary was opened in Mochi Katra and did good work in giving injections of N.A.B., and in reassuring the public. Cholera was responsible during the year in Rajputana for 5,343 cases with a regrettably high mortality, 51.47 per cent. of cases.

Colonel Watson comments on the highly insanitary state of Ajmere City. The causes are those customary in India: want of funds, the absence of any sanitary conscience in the general public, absence of any good system of town planning leading to an ever-increasing maze of insanitary, congested and filthy suburbs. The possibility of establishing incineration in place of trenching nightsoil is being investigated, also that of concentrating the butchers' shops together in a small central market in order to render efficient inspection easier. The water-supply never entirely adequate was seriously deficient during the year, and one of the city's first needs is an improved and better supply. Sanitary Inspector Mohamed Raza Khan is mentioned as doing his best, but it is amazing to note that in so large and prosperous a city as Ajmere there is still no Assistant Health Officer.

Vaccination showed a decrease during the year: the number of persons per mille successfully vaccinated being 24.06 as against 27.20 the previous year. The non-co-operation movement and general unwillingness of parents to have their children vaccinated were responsible. On the other hand the success rate was improved, 95.14 per cent. as against 91.34 per cent. in

the previous season. The former figure is really substantiated is very creditable.

Of improvements in hospitals and dispensaries the new female patients' block in memory of Lady Hardinge at the Mayo Hospital, Jaipur, was ready to receive patients at the end of the year, and a new ten-bed ward for male patients opened at Dungarpur. The urgent need for a really modern hospital at Udaipur has still to be met. The hospitals and dispensaries in Rajputana are steadily becoming more popular: a total of 1,608,065 admissions as against 1,527,593 for the previous year. Of the causes for admission it is interesting to note that in Rajputana diseases of the eye head the list, 267,153 admissions; malaria comes a good second, 238,582 admissions; and skin diseases third, 198,800 admissions. Scurvy accounted for 428 admissions, and 344 lepers received treatment during the year—chiefly with leproline. Plague was unimportant, but tuberculosis is rife and is correlated with the insanitary state of the towns and villages. Of surgical work operations for cataract head the list of major operations. Financially the medical work of the Province cost more than in the previous year, Rs 7,31,102 in the Indian States of Rajputana, as against Rs 5,97,040 in 1920-21: the increase being due to increased cost of staff, labour and especially of building materials.

With regard to female hospitals that at Jodhpur, under Miss L. Gainsford, M.R.C.S., L.R.C.P., is doing good work. 148 new in-patients and 5,994 new out-patients as against the figures 64 and 3,497 for the previous year. At Udaipur we learn that the lady doctor in charge of the Walter Zenana Hospital having gone on a year's leave, the hospital has been closed, and the keys are with the State authorities. Perhaps some patient will ask for them! The class for *dais* at Ajmere has been continued throughout the year, but none as yet exists in Indian States in the Province.

The figures for the jails shew few departures from normal. There was a small outbreak of cholera in Udaipur jail, with 6 deaths, and in the Jodhpore Central Jail the death-rate increased from 5.87 in the previous year to 29.50. Conditions of health and employment at Ajmere Jail were satisfactory, and the average earnings per head of prisoners employed on jail manufactures was Rs 28-9-7.

Reviews.

LABORATORY STUDIES IN TROPICAL MEDICINE.—By C. W. Daniels, M.B., F.R.C.P., and H. B. Newham, C.M.G., M.D., M.R.C.P., D.P.H., D.T.M. & H., Fifth, 1923 edition. John Bale, Sons and Danielsson, London. 576 pp. 184 illustrations and 7 coloured plates. Price, 25s. net.

THIS well-known handbook will be familiar to all laboratory workers in the tropics. The fifth edition represents a very great improvement upon the fourth edition, and we especially welcome additional illustrations from Dobell on the intestinal protozoa and from Balfour on the *Haemogregarines*. The first chapter on the laboratory and its equipment now contains a most useful collection of notes on the care of laboratory animals. Chapters 3 and 4 on the study of normal blood are particularly good, and many laboratory workers will welcome the "tip" of using 1 per cent. acid sodium phosphate in clearing old slides which it is desired to stain by Leishman's stain. Such films present many difficulties in staining and the method is worth trial. The differential table on p. 97 of the appearances in chlorosis, pernicious, splenic and secondary anæmias is most useful. The section on malaria, pp. 110 to 150 is good, and—as is not the case with many text-books—the terminology used is correct, we are glad to see that the authors clearly differentiate between gametocytes and gametes a point upon which many text-books are extraordinarily lax, and the confusion between which has led

to many and strange errors in protozoology. The *Leishmania* parasites are dealt with rather sketchily and the illustrations are perhaps rather poor. The account of *Haemoproteus* (where surely the authors might have given the true generic name as well as the more popular synonym *Hal'eridium*), is poor. The work of Acton and Knowles on the asexual cycle and that of Mrs. Adie on the sporogony cycle being entirely ignored. The spirochaetes are unfortunately included in the chapter on protozoa found in the blood plasma although admitted not to be protozoa surely they require differential treatment whilst *S. morsumuris* is surely not a *Leptospira*. Also the statement that "nothing is known of the development of the Negri bodies of rabies" is very incorrect. The authors will find a very complete study of them in various phases of development in Acton and Harvey's memoirs in *Parasitology* for 1911 and 1913, Vols 4 & 5.

In connection with the Widal reaction we are glad to see Garrow's agglutinator described, but regret that Dreyer's standard and invaluable technique has been omitted. The authors rightly advocate the use of the water-bath at 55° C, and of drop methods but omit the preparation of the standardised emulsions and of the use of agglutination units. The full Dreyer technique is the one method which is most reliable, and no other rough and ready method can compare with it,—at least in experienced hands.

Helminthology is, on the whole, well dealt with and the nine chapters on entomology are straightforward and will prove very useful to the student. Figure 158 on the internal anatomy of the mosquito is one of the best which we have seen. Plate VI is perhaps rather poor, but Plate VII on the malarial parasites is better.

The book, despite minor defects, is one which will be invaluable to the laboratory worker in the tropics. In its new, fifth edition, it is of very great value. The student in the laboratory and the general practitioner who, only too rarely in the tropics, makes a friend of his microscope will here find everything essential and all the desired information combined in a volume of handy size, well published and well illustrated. Prolixity is avoided and yet the volume is very complete. The specialist in his own branch will possibly find features to which he may raise objection,—for instance Haiden-heim's iron-haematoxylin method, especially if a carbolised haematoxylin stain be used, is preferable to Mallory's as here detailed. Yet for the general laboratory worker the book will be found to be very complete, an answer to all enquiries, and exceedingly useful. The fifth edition is a very great improvement upon the fourth, and well worth purchase.

COLLECTED PAPERS OF THE MAYO CLINICS.—
Edited by Mrs. H. M. Mellish, Vol. XIII, 1921.
Philadelphia and London. W. B. Saunders
Co., 1922. Price, 60s. net. Pp. 1,318.

THIS volume of the Mayo Clinics contains 118 papers by 76 authors and extends to over 1,200 pages. It is divided into sections dealing with the alimentary tract, urogenital organs, ductless glands, blood, skin and syphilis, head, trunk and extremities, nervous system, technique and general. Whilst the majority of the papers are surgical, there is a large number dealing with internal medicine, pathology, experimental bacteriology and neurology. It is obviously impossible for a single reviewer to deal with such diverse subjects and if the surgical papers seem to receive undue attention in this notice, it is not because those on medicine are not of equal importance and interest.

Carman has an interesting paper on the X-ray diagnosis of benign and malignant ulcers of the stomach by palpation of the barium-filled stomach during screen examination. He considers that there are two types of ulcer which evince definite roentgenological evidence of malignancy, one is the ulcerating cancer with meniscus-like crater, the other is the niche type of ulcer with an unusually large crater. In the presence of

either of these the radiologist is justified in diagnosing malignancy.

Eusterman discusses the end-results of operations for chronic benign ulcer of the stomach and duodenum. Of a total of 6,402 operations of all types performed in the Mayo Clinic, 228 were secondary operations and 57 of these were for jejunal ulcer. The others were necessitated by various causes, the commonest being the performance of a gastro-enterostomy in the absence of an intrinsic lesion of the stomach or duodenum, faulty technique resulting in "vicious circle," the overlooking of a concomitant lesion of the gall-bladder or appendix and in 23 of the cases, the supervention of carcinoma. It is noteworthy that in the Mayo Clinic the physicians take charge of the post-operative diet and treatment of these cases, experience having proved that many failures are due to too great haste in getting the patient back to an ordinary diet.

Balfour contributes a most interesting paper on the selection of the type of operation suitable for various classes of gastric ulcer. For the majority of cases he advocates his own operation of cautery excision combined with gastro-enterostomy, in preference to partial gastrectomy, particularly in bleeding ulcers to avoid recurrent hæmorrhage. The operative mortality of this procedure is only 18 per cent, and 80 per cent. of a series of 826 cases reported cure or improvement. Partial gastrectomy is reserved for large ulcers on the lesser curvature and near the pylorus and of course for all cases where there is any suspicion of malignancy.

Judd advocates excision of duodenal ulcer in preference to gastro-enterostomy in cases where hæmorrhage and localised pain are the chief symptoms and where operation reveals a mobile duodenum without interference with the lumen. The percentage of cases in which carcinoma followed on simple gastric ulcer was about 4 per cent and was quite unaffected by the type of operation performed. This accords with other series of statistics.

Rosenow continues his suggestive studies on the elective localisation of streptococci. Strains of streptococci isolated from cases of gastric ulcer, appendicitis and cholecystitis were injected into animals with the production of corresponding lesions. Similar results were obtained with strains isolated from the tonsils and infected teeth of cases of gastric ulcer. A great deal of attention is being paid at present to the question of deep seated chronic foci of infection, to which these papers are an important contribution.

Bumpus and Meisser bring forward evidence that pyelonephritis may often be due to focal infections by streptococci, originating in the teeth or tonsils, the *B. coli* infections in these cases being secondary.

Williamson and Mann detail the results of a long series of experiments on the prevention of peritoneal adhesions after operation by the use of paraffin, olive oil, silver foil, Cargile membrane, rubber dam, etc. Partial success was obtained with a gelatine-gum mixture, but it is concluded that the introduction of foreign substances into the peritoneal cavity is not justifiable. The general opinion nowadays is that peritoneal adhesions are part of the process of healing and are not likely to give trouble, provided that the cause of the adhesions has been adequately dealt with at the operation.

Sistrunk presents the results of 218 radical operations for carcinoma of the breast. Of 132 cases with glandular involvement 22 per cent. were alive five years later, and 65 per cent. of the 86 in whom the glands were unaffected. Taking both series together, the percentage of five-year cures was 39 per cent, results which compare favourably with other published series.

Several papers on the surgery of the thyroid emphasise the increasing importance attached to estimations of the basal metabolic rate in the diagnosis of early cases of exophthalmic goitre, in gauging the degree of hyperthyroidism and in assessing the operative risk.

Wilson has a beautifully illustrated series of 35 cases of thyroid tumours, mostly malignant, followed by a full bibliography.

In an important paper on the pre-operative preparation of patients with obstructive jaundice, Walters states that 50 per cent of 29 fatal cases died from intra-abdominal hæmorrhage, the source of which could not be traced at the necropsy. In most of these the coagulation time was over nine minutes. Daily intravenous injections of 5 c.c. of 10 per cent calcium chloride for three days with glucose per rectum and large quantities of fluid by the mouth enabled operation to be performed on 15 patients who would otherwise have been refused.

Stokes and Osborne in a series of 25 cases of neurosyphilis found that the results of spinal drainage combined with arsphenamine were not superior to those obtained by arsphenamine injections alone. In ten of these cases a subsequent course of Swift-Ellis intraspinal treatment gave better results as gauged by the lymphocyte count and the Wassermann reaction.

Hedblom deals with every aspect of the diagnosis and treatment of tuberculous empyema. Open operation is of course to be avoided except in the presence of a mixed infection. For long standing cases a number of operations are available, and the indications for Wilm's, modified Estlander and Schede's operations are discussed with reference to actual cases.

Henderson's paper on the end-results of treatment of 222 fractures of the femur, mostly remote, rouses expectations which are not fulfilled, owing to the classification of results into "cured" and "improved," which conveys nothing to the reader, however much it may convey to the surgeon in charge of the cases.

Space does not permit of the review of more of these interesting papers. All are commendably brief and many are accompanied by excellent bibliographies. The volume should be in every reference library and its perusal can be recommended to all who wish to keep in touch with transatlantic work.

AIDS TO TROPICAL HYGIENE.—By Colonel R. J. Blackham, C.B., C.M.G., C.I.E., D.S.O., D.P.H. Second Edition. London, Baillière, Tindall & Cox, 1922. Pp 240. Price, 4s 6d net.

This is one of the "Students Aid" series and the aim of the book as stated in the preface is to provide the student for the D.T.M. and H. and the Major R.A.M.C. going up for his promotion test with a ready means of revising his reading before examination and to furnish the junior practitioner with a handy pocket-book containing a summary of the main facts with which the health officer in the tropics must be acquainted. This aim is an admirable one but we must frankly state that it is doubtful whether the author has realised it. A book of this nature is difficult to compile, it should not be discursive but should give accurate information in a readily available form. There are no illustrations or diagrams and this omission detracts largely from the value of the sections on latrines, septic tanks, and incinerators, the descriptions of which are vague and indefinite and too general to be of any real assistance. A few subjects such as malaria are treated fully but the information on others is scanty. Ankylostomiasis does not appear in the index, nor under "Animal Parasites", the only information given about this important subject is in a line in the "Epidemiological Table of Diseases." There are many statements such as the following "Cimex rotundatus transmits leishmaniasis according to Rogers and Patton, and probably cerebro-spinal fever and typhus fever." We doubt whether, in its present form, the book will be of much real assistance to the examinee or the serious student of tropical hygiene, but if the author would remould it, say on the lines of the "Field Sanitary Notes for India," giving tables of accurate information and descriptive diagrams of good pattern latrines,

incinerators, etc., and avoiding discussions on controversial matters he would be doing a service to the profession. There is room for such a book.

SMELL, TASTE AND ALLIED SENSES IN THE VERTEBRATES. By G. H. Parker, Sc.D., J. B. Lippincott Co., Philadelphia and London. Price, 10s 6d net. Pp 192.

THIS book is one of a series of monographs on experimental biology by American authors. Smell and taste are allied sensations as shown by the experiments of Powlow, and the psychical elements are regarded as much more important than the physiological in the biochemical processes involved in digestion. The interrelation and genetic connection of these two senses form the principal standpoint from which they are considered in this book.

The first chapter deals with the nature of the sense organs, which the author rightly terms as "receptor," because all the sense organs are not necessarily concerned with sensation. The impulses that flow from the vestibular portions of the human ear and from the sensory endings in our muscles and tendons are not productive of any sensation. The account of the biological evolution of some of the special sense organs and their special limitations in the lower vertebrates is interesting.

The third chapter deals with the physiology of olfaction. The experiments in connection with the course that the current of air takes through the nasal chamber showed that inspired air takes a curved course and the highest part of the curve was near the middle of the nasal cavity but never reached a point as high as the olfactory cleft, whereas during expiration a lower course is taken. The odours of our food are conveyed to the olfactory surfaces through the choana rather than through the external nares. The author describes various olfactometers for measuring the olfactory acuity and also for comparison of odours. The olfactory stimulus was shown to be dependent in the solubility of the odorous substances in lipoids or other solvents present in the olfactory hairs. The question of fatigue and exhaustion of the olfactory organ was also dealt with. An attempt was made to classify the quality of innumerable odours. By an ingenious system Henning attempted to connect odour with chemical constitution and to divide aromatic bodies into six classes according to their molecular structures. The author concludes this chapter by dealing with the connection of olfaction with the quest of food.

In chapter IV the vomero-nasal organs are dealt with but no satisfactory conclusions about the function of these organs appears to have been arrived at.

The chapter on the physiology of gustation has been written in a very interesting manner. Materials insoluble in water are tasteless. The qualities of taste are divided into several groups. The intensity of sour taste depends on H-ion concentration. Thus a saline taste is called forth by a number of anions: chlorine, bromine, iodine and the sulphate and nitrate ions. The bitter taste has as stimuli the alkaloids, such as magnesium, ammonium and calcium and possibly the anion of picric acid. The sweet taste depends upon such organic compounds as the sugars and alcohols and on saccharine, on lead acetate, on hydroxyl and glucinum ions. The four tastes are excited by independent groups of stimuli and associated with their distribution on the tongue. Mixtures of sapid solutions do not as a rule give rise to tastes other than those of their components.

In the last chapter the author summarises by noting the inter-relations between the sensations of the olfactory organs, the vomero-nasal organs, the common chemical receptors and the organs of taste. The common feature is that they are activated by solutions, aqueous or lipid. Smell and taste are closely involved in the feeding reflexes.

The author is to be congratulated on his attempt to present with scientific precision to his readers a clear exposition of the biological factors in connection with two important sense organs vitally associated with the nutrition of the body

CLINICAL LABORATORY METHODS.—By Russell Landram Haden, M.A., M.D., University of Kansas C. V. Mosby Company, St. Louis, 1923. 294 pp., 69 illustrations, 5 colour plates. Price, 3.75.

THIS is a most useful and exceedingly well got up and illustrated handbook. The chapters deal with the qualitative and quantitative examination of urines, analysis of the gastric juice, examination of the sputum, faeces, and blood,—the latter very fully from both qualitative and quantitative points of view,—serological technique, preparations of bacteriological solutions, stains and media, general bacteriological and clinical pathological methods, histological technique, examination of milk and water and miscellaneous chemical and biochemical procedures

The volume is thoroughly up to date. For sugar tests of the urine the author prefers Benedict's reagent,—results being illustrated by a colour plate. The reference tables throughout will be found most useful to the laboratory worker. Tests for renal function are well dealt with and the most recent and standard methods given. It is rather to be regretted that the author has gone to Craig's "Parasitic Amœbæ of Man" for his description of the entamœbæ, rather than to Dobell's far more authoritative works. The tray for holding materials for blood examination and the suction apparatus for cleaning blood counting pipettes are most ingenious. The importance of the Sahli and Hellige hæmoglobinometers are well dealt with. Griffin and Sandford's methods for estimating the fragility of the R. B. Cs is given in detail. Table XV giving the appearances of the malarial parasites in fresh blood might well be omitted, since we doubt whether any laboratory worker in the tropics ever adopts this antiquated procedure. On the other hand Table XVI giving the appearance of the malarial parasites in stained films is useful, though we think that it might be made much more accurate and complete. The chapter on quantitative blood estimations is probably the best in the book. It is very complete and includes all the latest methods. The Wassermann reaction is very well described, and the imperative necessity for repeated titration of amboceptor and complement emphasised. A full colour plate illustrates positive doubtful and negative results. For the Widal reaction Dreyer's technique is rightly preferred, and we are glad to note that the author prefers Ponder's stain to any other for diphtheria bacilli. In examining for *T. pallidum* Medalla's modification of Wright's stain is given. Surely Fontana's method should have preference. Tables XLII and XLIII on the sugar reactions of Gram-negative bacilli and cocci are very complete, and include more information than is often given in text-books. And Table XLIV on the classification of the streptococci is excellent.

The histological chapter in the book leaves a good deal to be desired. The author does not mention Haidenheimer's iron-hæmatoxylin technique for instance and surely there is no better method for general and accurate work. On the other hand throughout the book methods for the estimation of hydrogen ion concentration of different fluids and media lend a special value to the book and render it thoroughly up to date.

There are points in which other laboratory workers may disagree with Dr. Haden's book in its selection of the best methods. Its protozoology, for instance, is weak and its direct applicability to tropical needs limited. On the other hand the clinical physician and, above all, the biochemist will greatly appreciate the book. Whist it is one which will be of value to the general laboratory worker, and to the physician who desires to take up clinical laboratory work for the benefit of his patients and himself. The binding and the excellent illustrations leave nothing to be desired.

Correspondence.

EXPRESSION VERSUS CAPSULOTOMY

To The Editor of THE INDIAN MEDICAL GAZETTE.

SIR,—With reference to Dr. Holland's letter in your February number, I should be glad if you would allow me to draw attention to certain first principles, without entering into the merits of the case under discussion. I ask this because any departure from such principles weakens the status of Indian surgeons with their European and American colleagues.

1 Neither numbers of cases, nor years of work, will carry conviction apart from a correct presentation of convincing facts. A surgeon's *opportunities* give him a claim to be heard, but no more.

2 Ophthalmic surgeons the world over are of one mind as to the value of antiseptics and asepsis in ophthalmic operative work, and Indian surgeons can claim no small part in the establishment of the great principle here involved. The time when it was thought that the eye could not stand antiseptics, and could not be rendered aseptic is long past. I sincerely hope that the ophthalmic surgeon in India is not going back on the work that has been done by his predecessors. His ante-operative preparations should be meticulous. He owes this to his patient.

3 It is *not* difficult to take very accurate notes of each case operated on in India. I can speak from personal experience on the subject, not only in the fine hospital in Madras, but also in the mofussil, and in private work. Moreover the following up of the cases is not really an impossibility—where there's a will, there's a way.

If the Indian surgeon wishes and expects his Western brother to respect his work, as I for one want to see it respected, he must show him that his standards of technique, of professional responsibility, and of scientific accuracy are as high as, or higher than, those that hold in Europe and America.

I am not entering into an argument on the merits of a particular operation. I am endeavouring to set before the Indian ophthalmologist standards which he can and should make his own, and from which I would venture to express a very earnest hope that he will not depart.

Yours, etc.,

R. H. ELLIOT, M.D., Lt-Col,
I.M.S. (retd.)

12th March, 1923

BERGER'S STEREOSCOPIC LENSES

To The Editor of THE INDIAN MEDICAL GAZETTE.

SIR,—In the March number of the *Gazette* there is an article on Berger's stereoscopic lenses in ophthalmic practice by Lt-Colonel Newman, I.M.S. The author has evidently been much impressed by their value. That they have also been found useful by other ophthalmologists is evidenced by the fact that they have been in use in the Government Ophthalmic Hospital, Madras, since 1910. They are therefore not altogether unfamiliar to students of eye disease in this part of India. They are not necessarily the best for all the types of work for which binocular loupes are used. The "Zeiss," "Collins" and "Handlupe" of the Eilhard-Schulze type will all be found useful, apart altogether from those cases in which it is more desirable to use a corneal microscope. Every department in this hospital has a Berger's loupe, but in some it takes a second place to the Zeiss and 'binokulare handlupe' instruments. The Berger certainly has the advantage of being cheap as loupes go.

Yours, etc.,

H. C. CRAGGS, Major, I.M.D.,

Assistant to the Professor of Ophthalmology,
Madras Medical College

27th March, 1923

THE TRAINING OF PUBLIC HEALTH OFFICIALS

To The Editor of THE INDIAN MEDICAL GAZETTE

SIR,—Surely the time has come for those who are responsible for drawing up the curriculum of studies for persons who desire to qualify themselves to hold public health appointments to consider the position. As matters now stand a public health official must first obtain a qualification to practise medicine, surgery and obstetrics, then he has to spend a lengthy period in acquiring the knowledge considered necessary in his speciality and finally to pass an examination in it.

It is already recognised that the curriculum for medical students is heavily overloaded and that there is a limit to the amount of knowledge a man can assimilate, yet in England the course for the D.P.H. is to be extended in time and scope and a period of two years has to elapse between the moment of registration of qualification to practise medicine and the beginning of the public health course of training, during which the newly qualified man may occupy himself as he pleases. Presumably the aim of the authorities is to deter men from taking the public health qualification who do not intend to take up public health as their life work, and to obtain those only for the public service who feel that it is their real calling.

Unless some way out be found the immediate result in England will be to exclude from the public health service all men whose resources do not enable them to live without earning till about 27 years old.

In India this would be a fatal objection to a similar scheme.

I cannot see any necessity for such burdensome regulations in India or in any other country. While admitting that no man can acquire too much knowledge of any kind, practical and financial considerations make it necessary to fix a limit to the knowledge that must be required of a man before he is deemed fit to follow certain callings, and the public health service is one of those. If a man is never going to treat sick people but is going to try to prevent people from falling sick why should he spend years in acquiring knowledge which is necessary for the treatment of the sick but of no use in preventing people from falling sick.

Briefly, my point is this, that it is not now either necessary or desirable that a prospective public health official should go through the regulation medical course and obtain a license to practise. In fact if he does so he will waste valuable time which ought to be devoted to other studies more closely related to the occupation he proposes to engage himself in.

While a public health official has to know as a form of general knowledge a great deal that the medical student has to know, he has also to regard it from a totally different standpoint. Much detail in certain branches of knowledge which a medical student must be familiar with is quite outside the range of a public health official and, conversely, much knowledge that is not included in the curriculum of the medical student is part of the necessary equipment of the other.

It should be possible, by relieving students of much in the medical student's curriculum and giving them time to study subjects nearly related to the prevention of disease, to turn out in the same number of years as it takes to turn out a qualified medical man, men much better qualified to guard and improve the public health than it is now possible to get.

What is wanted in India, just as in Europe, is not more men trained to alleviate sickness, but more men trained to prevent preventable disease and to teach people how to live aright. We shall never get enough of these if we recruit them solely from the ranks of qualified medical men, nor by that method are we likely to get men who possess all the special knowledge a public health official ought to possess if he is to be not only efficient executively but also able to extend the scope of his vocation. The public health student requires a general knowledge of anatomy human and comparative, not the detailed knowledge required by a demon-

strator or a surgeon, a general knowledge of physiology, not all the details required of a medical student. He must have some familiarity with the sick and be able to recognise infective diseases and, in general, departures from a state of health. Accurate diagnoses would not be expected of him. He need know nothing of the practice of medicine, surgery and obstetrics, of therapeutics, pharmacology, medical jurisprudence, pathological anatomy or of histology apart from an understanding of physiological processes.

He does require a good general preliminary education, a fair knowledge of physics and chemistry, the natural history of disease, general pathology, bacteriology, general hygiene and sanitation, the natural history of communicable diseases of animals and plants and a good general acquaintance with botany, zoology, geology, and meteorology. He must know something about agriculture and must be familiar with the laws relating to public health and with statistical methods. The hygiene of industries must receive his attention and particular stress must be laid on the science of nutrition.

All these matters may be grouped as primary studies and until the student has a good grasp of them he is not fit to assimilate and to interpret correctly the facts, hypotheses, and surmises which form the substance of his secondary studies, and it will be on the correct interpretation of the latter that his success in the matter of the prevention of disease will be based. The man who does not get beyond the primary studies may make a good executive health officer, but never one who will help to advance the prevention of disease to the position it ought to occupy.

The secondary studies can nearly all be included under the heading of "biology" biology in its widest sense, the study and interpretation of life in all its phases, the relationship of all living things, animal and vegetable, to one another and to the inanimate world. They cannot be compressed into a course of reading followed by an examination, but are life long studies. It can only be suggested to the student what he should read and how he should study and any qualifying examination would have to be a test of general knowledge, intelligence and reasoning power instead of a test of memorised pages.

The prevention of disease is so intimately bound up with every aspect of civilization that it cannot be considered apart from any of the activities of mankind. Under the heading "biology" I include sociology, anthropology, ethnology, psychology, eugenics and religion.

Three years spent on the primary studies by a man who has already taken his B.A. should suffice to produce an efficient executive health officer. Some of them might then specialize in statistics, chemical analysis, bacteriology, epidemiology, or in other directions.

Two more years occupied in "biological" studies ought to produce a man whose thoughts have at least been directed into channels from which they may spread over fields which only await this energizing fluid to become productive.

Of course the first objection that will be heard to such a proposal will be the expense but can any intelligent administration doubt that it is doing the right thing by the community whose well-being it is responsible for if it expends revenue on a system which will lead to a definite return in the way of better health and increased power to work and to get the best out of life, perhaps in the present generation, certainly in the next? Money spent on medical relief, in the treatment of established disease, gives a small return in the present generation and none in the next, whereas money spent on the prevention of disease may have little effect on the present generation but may give an incalculable return in the next and succeeding generations. Which is the better finance? Which is the greater duty, to provide for our immediate needs or to provide for the betterment of the race?

Yours etc.

J W CORNWALL, Lt.-Col., R.M.S.

25th March, 1923

SPINAL ANALGESIA

To The Editor of THE INDIAN MEDICAL GAZETTE.

SIR—I have read with interest the short note on this subject by Major Porter in the January number of the *Gazette*. I quite agree with his views that "it is a great pity that this method of analgesia is not taught and practised in all medical schools and affiliated hospitals in this country." Personally I am afraid that spinal analgesia is not used by many surgeons partly through sheer prejudice and partly through lack of confidence. Unfortunately it is brought into disrepute by inexperienced hands or by overlooking the little details regarding the preparation of the patients, the technique of analgesia and after-treatment.

In another place (*Edinburgh Medical Journal* of June July, August 1922), I have published a monograph on the subject "Observations on Spinal Anæsthesia" wherein I have treated the subject very fully, particularly with reference to after effects and complications.

Without going into detail I will lay down a few axioms which I have found useful from my experience as an operating surgeon for seven years at Chelsea Infirmary and at Porbandar.

(1) Always take the blood-pressure as a routine before deciding on the administration of spinal analgesia. If it is less than 95 mm take great care or better avoid it. The same rule applies to cases of myocardial degeneration, aortic disease, or when there is a very high "pulse pressure" i.e., the difference between systolic and diastolic pressures.

(2) Whenever possible administer preliminary injections of omopon scopalamine to induce a modified form of twilight sleep. This produces amnesia and prevents nervous symptoms, e.g., restlessness, shivering, and retching. I give three half-hourly injections of these drugs.

(3) Always infiltrate the track of lumbar puncture by cocaine solution. It has two advantages. It prevents unnecessary pain and sudden flinching, and it also gives a fair idea of the anatomical condition of the spine. I am convinced that headache, particularly of the occipital type, is due to lack of gentleness in performing the puncture. I do not attribute it to the effects of stovaine, which only produces slight frontal headache.

(4) Before injecting stovaine notice the intra-spinal pressure of the cerebro-spinal fluid. For recording it accurately I use a special manometer which was suggested by me and made for me by Messrs Allen & Hanbury of London. If the pressure is below four inches i.e., low (a) do not withdraw any cerebro-spinal fluid, (b) do not give more than half the dose, and (c) do not lower the patient's head for ten minutes. This will prevent diffusion of the solution to a dangerously high level. Thus the dose of stovaine solution is regulated not according to the nature of operation but according to the condition of the patient.

(5) The blood-pressure should be taken every five minutes during the operation and as soon as it falls below 90 mm measures should be taken to raise the pressure such as lifting the patient's legs in the air, compression of the abdomen, Trendelenburg's position and injection of pituitarin or adrenalin.

(6) Keep the ward quiet and darkened by pulling the blinds down or by screening the bed. Unless Fowler's position is absolutely indicated the head should be kept low on a soft pillow for at least twenty-four hours.

In conclusion I may say that spinal analgesia is perfectly safe in experienced hands. I have used it in my surgical practice for all kinds of operations up to the level of the diaphragm including gynaecological operations such as Wertheim's hysterectomy, and the age of the patients varied from 22 to 82 years.

Yours, etc.,

D N KALYANVALA, M.R.C.S. (Eng)
Chief Medical Officer, Porbandar State

PORBANDAR 11th March, 1923

Service Notes.

WOMEN'S MEDICAL WORK.

Contributed by Miss R Young, Delhi

Miss Trouton, M.B., Ch.B. (Lond.), and Miss Walker, M.B., Ch.B., Belfast, have been appointed to the Women's Medical Service and will shortly arrive in India.

Miss G Mahomed Ali, W.M.S., has been appointed as Medical Officer in charge Dufferin Hospital, Hyderabad.

Miss B Thungama, W.M.S., has been appointed reserve medical woman, Agra.

Miss C Houlton, M.D., returns to India in June to take charge of the Dufferin Hospital, Simla.

Dr. Dagmar Curjel, W.M.S., in November completed a year's work in Bengal during which time she enquired into the maternity conditions of women workers in the jute, cotton, tea and coal industries. Dr Curjel's report is shortly to be published by the Government of India, Industries Department. Dr Curjel in January undertook a somewhat similar enquiry under the Board of Mines, Dhanbad, her services having been put at the disposal of the Board by the Countess of Dufferin's Fund.

Dr. Agnes Scott has left India on furlough, and her place as Assistant to the Inspector-General of Civil Hospitals, Punjab, is being filled by Dr Dagmar Curjel.

We are glad to report that the United Provinces Government has decided to continue the post of Woman Assistant to the Inspector-General of Civil Hospitals which was temporarily discontinued under pressure of financial stress in 1922. Dr S H Commissariat W.M.S. holds the appointment.

THE second General Meeting of the Lady Chelmsford All-India League for Maternity and Child Welfare took place at Viceregal Lodge, Delhi on the 27th March. Her Excellency the Countess of Reading presiding. The annual report and balance sheet for 1922, was presented. The League appears to be in a sound financial position and its work continues to expand in a very satisfactory way. A branch has recently been formed in the United Provinces which it is hoped will result in energetic measures to reduce maternal and infant mortality. Branches were formed during the previous year in Madras and in the Punjab and both these Provinces have opened schools where women of the Province can be trained as health visitors through the medium of their own vernacular. The Central Body of the League has itself carried on a training school for Health Visitors at Delhi, and has shown considerable activity in the direction of publications and propaganda. It has prepared a Travelling Exhibition which has already, with success, visited several parts of India. Lectures on Infant Welfare with the special slides prepared by the League have been delivered in most of the Provinces of India. In addition to these activities the League gives grants to assist Infant Welfare Centres in many parts of India.

In supersession of this Department Notification No 232, dated the 4th April, 1922, the privilege leave for two months granted thereby to Major R B Lloyd M.B., M.S., Imperial Serologist, is commuted into special leave for 60 days combined with leave on half average pay for one day.

LEAVE

MAJOR-GENERAL B H DEARE, C.I.E., K.H.S., I.M.S., Surgeon-General with the Government of Bengal, is granted leave on average pay for four months, with effect from the 9th April, 1923, or the subsequent date on which he avails himself of it.

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"A mother's milk is only adequate when she receives a sufficiency of these subjects (vitamins) in her own diet."

pp 70 and 100 Report of Joint Committee of Lister Institute and Medical Research Committee on "Accessory Food Factors (Vitamins)" H M Stationery Office, 1919

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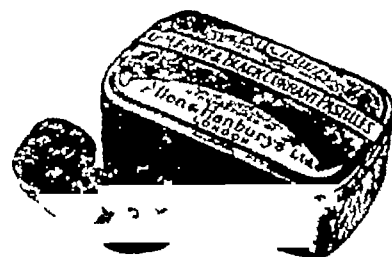
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LIEUTENANT-COLONEL R. F. STANDAGE, C.I.E., F.R.C.S., I.M.S., and Agency Surgeon, is granted leave on average salary for three months, with effect from the 15th March, 1923, or the subsequent date on which he avails himself of it.

UNDER Rules 81 (b) (i) and 87 (a) of the Fundamental Rules, leave on average pay for six weeks and on half average pay for one month is granted to Major H. Watts, M.B., B.S., M.R.C.S., L.R.C.P. I.M.S., Civil Surgeon, Betul, with effect from the 1st April 1923, or any subsequent date on which he may avail himself of it.

COLONEL H. AUSTEN SMITH, C.I.E., M.B., K.H.S., I.M.S., Inspector-General of Civil Hospitals, Bihar and Orissa, is granted leave on average pay for six months, with effect from the 3rd May, 1923.

APPOINTMENTS

LIEUTENANT-COLONEL D. McCAY, M.D., I.M.S., Professor of Clinical Medicine, Medical College, Calcutta, is appointed to officiate as Surgeon-General with the Government of Bengal, with effect from the date on which he assumes charge of his duties.

LIEUTENANT-COLONEL H. AINSWORTH, M.B., F.R.C.S., I.M.S., Principal and Professor of Ophthalmology, King Edward Medical College, Lahore, is appointed to be Inspector-General of Civil Hospitals, Bihar and Orissa, in succession to Colonel H. Austen Smith, C.I.E., M.B., K.H.S., I.M.S., with effect from the 3rd May, 1923.

LIEUTENANT-COLONEL W. H. KENRICK, I.M.S., Civil Surgeon, Jubbulpore, is appointed to officiate as Inspector-General of Civil Hospitals, Central Provinces, with effect from the date on which he assumes charge of his duties until further orders.

CAPTAIN J. B. HANCE, O.B.E., F.R.C.S.E., I.M.S., on return from leave, is placed on special duty in the Dera Ismail Khan District, with effect from the 23rd February, 1923.

BREVET MAJOR W. ROSS STEWART, M.B., F.R.C.S.E., I.M.S. Staff Surgeon, Bangalore, is appointed, in addition to his own duties, to officiate as an Agency Surgeon and is posted temporarily as Residency Surgeon, Mysore, during the absence on leave of Lieutenant-Colonel R. F. Standage, C.I.E., F.R.C.S., I.M.S.

CAPTAIN R. SWEET, D.S.O., M.B., I.M.S., to be Assistant to the Officer-in-Charge Medical Store Depot, Madras, from 12th to 20th February, 1923.

CAPTAIN R. SWEET, D.S.O., M.B., I.M.S., to be Officer-in-Charge, Medical Store Depot, Madras, with effect from the 21st February, 1923, and until further orders.

CAPTAIN L. A. P. ANDERSON, I.M.S., is appointed officiating Assistant Director, Central Research Institute Kasauli with effect from the 31st January, 1923.

MAJOR E. C. HODGSON, D.S.O., I.M.S., is appointed Assistant Director, Central Research Institute, Kasauli, with effect from the 27th February, 1923, and is seconded for appointment as officiating Assistant Director-General Indian Medical Service (Sanitary), with effect from the same date.

MAJOR H. H. KING, I.M.S., is appointed officiating Assistant Director, Central Research Institute, Kasauli, with effect from the 27th February, 1923.

MAJOR G. G. HIRST, I.M.S., Officer-in-Charge, Medical Store Depot, Madras is appointed to be Assistant Director-General, Indian Medical Service (Stores), vice Lieutenant Colonel A. A. Gibbs, I.M.S., with effect from the 5th March, 1923 until further orders.

TRANSFERS

THE services of Captain F. H. Smith, I.M.S., are placed temporarily at the disposal of the Government of Burma, with effect from the date on which he assumes charge of his duties in the Jail Department.

THE services of Captain J. C. Bharucha, I.M.S., are placed temporarily at the disposal of the Government of Madras, with effect from the date on which he assumed charge of his duties in the Jail Department.

THE services of Major E. E. Doyle, D.S.O., I.M.S., are placed temporarily at the disposal of the Government of Bombay, with effect from the date he assumes charge of his duties in the Jail Department.

IN supersession of the Home Department Notification No. F-240-Jails, dated the 9th February, 1922, the services of Captain N. S. Jatar, D.S.O., I.M.S., are placed permanently at the disposal of the Government of the Central Provinces for employment in the Jail Department with effect from the 21st January, 1922.

THE services of the following officers of the Indian Medical Service are placed permanently at the disposal of the Government of Bombay, with effect from the dates mentioned against their names —

MAJOR S. J. BHATHENA, 24th October, 1921

MAJOR A. G. COULIE, M.B., F.R.C.S.E., 9th October, 1922

MAJOR A. N. THOMAS, M.B., D.S.O., 15th January, 1923

THE services of Lieutenant-Colonel F. P. Mackie, I.M.S., Director, Pasteur Institute, Shillong, are placed at the disposal of the Government of Bombay for appointment as Officiating Director, Bombay Bacteriological Laboratory.

THE services of Major J. Taylor, I.M.S., Officiating Director, Bombay Bacteriological Laboratory, are placed at the disposal of the Government of Burma for appointment as Assistant Director, Pasteur Institute, Rangoon.

THE services of Major H. E. Shortt, I.M.S., attached as a supernumerary officer to the Pasteur Institute, Shillong, are placed at the disposal of the Government of Assam for appointment as Officiating Director of the Institute.

THE services of Captains R. H. Candy and C. M. Plumtre, I.M.S., are placed temporarily at the disposal of the Government of Bombay, with effect from the date on which they assume charge of their duties.

THE services of Captain A. W. Duncan, I.M.S., are placed temporarily at the disposal of the Government of Bihar and Orissa, with effect from the date on which he assumes charge of his duties.

THE services of Captain W. C. Paton, M.C., M.B., F.R.C.S.E., I.M.S., are placed temporarily at the disposal of the Government of Madras, with effect from the date on which he assumes charge of his duties.

NOTICES.

THE LATE NORTH PERSIAN FORCES

WE have been asked by the War Office to announce the institution of a Memorial Trust Fund, commemorative of the services of the late North Persian Forces, which has been subscribed by officers of the Royal Army Medical Corps and Indian Medical Service who served with these Forces.

IN accordance with the desire of the subscribers to encourage the study of Tropical Medicine and Tropical

Hygiene it has been decided that the Memorial should take the form of a silver medal, to be known as the "North Persian Forces Memorial Medal," to be awarded annually for the best paper on Tropical Medicine or Tropical Hygiene published in any Journal during the twelve months ending 31st December by any Medical Officer, of under twelve years' service, of the Royal Navy, Royal Army Medical Corps, Royal Air Force, Indian Medical Service, or of the Colonial Medical Service.

The first award will be for the best paper published during the twelve months preceding 31st December 1923.

The award will be announced in the latter part of the year following that in which the paper was published, provided that the Memorial Committee consider the papers published to have attained a standard of merit justifying an award.

CALCUTTA SCHOOL OF TROPICAL MEDICINE AND HYGIENE

THE undermentioned candidates are declared to have passed the Examination for the Diploma in Tropical Medicine held on the 3rd April, 1923, and the subsequent days. The names have been arranged in alphabetical order. There were 34 candidates and 19 passed.

Dr Sushil Kumar Basu
Civil Asst. Surgeon Pramatha Kumar Bhattacharyya (Bengal)
Civil Asst Surgeon Bankim Chandra Chatterjee (Bihar & Orissa)
Dr Bijoy Krishna Chatterjee
Military Asst Surgeon Melville George Coombes, I M D
Civil Asst Surgeon Albert Francis Winnington daCosta (C P)
Dr Jahnnabi Sekhar Datta
Civil Asst Surgeon Rashbehari Dutta (Bengal)
Dr Sailendra Kumar Ghosh Dastider (Bihar & Orissa Govt. Scholar)
Dr Hari Das
Dr Jaychand Harjivan Kumbhani
Military Asst Surgeon George Mackey, I M D
Dr Tarak Nath Majumdar
Civil Asst Surgeon Chandu Charan Mitra (Bengal)
Dr Bankim Kumar Pal
Dr Badri Narayan Prasad (Bihar & Orissa Govt Scholar)
Dr Bankes Chandra Ray
Dr Gopiballabh Sahay (Bihar & Orissa Govt Scholar)
Civil Asst Surgeon Khagendra Benod Sinha (Bengal)

A CLEARANCE SALE OF MICROSCOPES AND ACCESSORIES

THE City Sale and Exchange, 81 Aldersgate Street, London E C 1, ask us to bring to the notice of readers that they are reducing their stock by a clearance of microscopes and accessories, and will be glad to send an illustrated circular upon request. Some of the items listed may be of interest to those in search of microscopes at reduced prices. From among others one notes a Koristka CCa model, fully equipped for bacteriological work, with a 1 $\frac{1}{16}$ th inch semi-apochromat objective, in addition to 2 $\frac{1}{3}$ rds, 1 $\frac{1}{6}$ th and 1 $\frac{1}{8}$ th objectives for £26-5-0 a Lawrence and Mayo dissecting microscope for £1-11-6 a Beck's dissecting microscope for £1-3-6 and a microphotograph camera with a 100 c p $\frac{1}{2}$ watt lamp for £19-19-0.

MELLIN'S FOOD PRODUCTS

THE question of the scientific feeding of those hand-reared infants who must be artificially fed from birth as well as of infants at the weaning stage is one of continuous importance to the medical profession as also to health welfare workers and maternal and infant clinics. Closely connected with such work also is the equally important matter of providing scientifically adapted nourishment for invalids. In both mat-

ters the firm of Mellin's Food, Ltd, have for many years held and retained predominance. Their series of dietetic preparations have stood the test of time with great success, and are well known to the medical and nursing professions.

The primary product of the firm, and that on which its fame originally rests, is Mellin's Food for infants and invalids. This consists of a brownish granular powder prepared chiefly from malt and wheaten flour, in which the starch has been converted into its soluble products by the action of vegetable diastase. The process by which this widely used product is made is the result of many years of experience and experiment in the well-equipped laboratories which are the outstanding feature of the firm's great works and every care is taken, by continual testing during and after the completion of each process to ensure that Mellin's Food shall be consistent in quality. Mellin's Food modifies cow's milk with the important result that this milk is rendered physiologically and chemically like human milk. Thus an infant fed on this food is receiving in the proper proportion everything that it would receive from the natural method of feeding, and benefits accordingly.

Another important preparation made by the firm is Mellin's Lacto Glycose, prepared from Mellin's Food and cow's milk. It is designed for temporary use where cow's milk cannot be obtained, or where—for any reason—the local milk supply is under suspicion. It is both palatable and very easy to prepare as for use it only requires mixing with warm water and constitutes an excellent food for the aged and for invalids. Mellin's Food biscuits are prepared from Mellin's Food and wheat and present in a pleasant and palatable form, nourishment for children during weaning and for the change from a milk to a more solid diet.

Mellin's Food, Limited, have also placed on the market a baby's feeder which is perfectly hygienic and in which those difficulties which are adherent in the older form of feeder have been entirely overcome. The feeders are tubeless, and possess the advantage that the food is kept in contact with the teat until the child has entirely finished feeding so that there is no space from which the child can draw air whilst it is feeding. All markings are sand-blasted on the outside of the bottle, thus obviating the numerous internal indentations of the bottle which make some types of bottle so hard to clean. Thus the child is protected from the risk of accumulation of sour particles, than which there could be no more important advance in scientific feeding methods.

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CLINICAL KALA-AZAR WORK PERFORMED AT THE SPECIAL KALA-AZAR HOSPITAL, SHILLONG, DURING 1922

By H E SHORTT,

MAJOR, I M S,

Officiating Director, Pasteur Institute, Shillong
and

RAM TARAN SEN,

Assistant Surgeon in charge Special Kala-azar Hospital, Shillong

Introductory—In the following brief record of the clinical work performed in the special Kala-azar Hospital at Shillong during the year 1922 special attention has been paid to details of treatment, rather than to a record of clinical signs and symptoms. The latter have been dealt with at such length by various writers that the study of the cases in the present series reveals no sign or symptom which has not already been described in full detail.

It should be pointed out, before proceeding to a description of our results, that the class of case treated in this hospital differs in some respects from that treated in other hospitals. Owing to the activity of the Public Health Department in Assam, the number of centres for the treatment of kala-azar in this province, and the judicious location of these in convenient centres are such that very few of those attacked by the disease have any difficulty in attending the nearest centre for treatment. As a result of this organisation the vast majority of sufferers receive at these centres more or less prolonged courses of antimony salts, and those cases only which either do not readily respond to the treatment, or which relapse after one or more courses of treatment, present themselves at Shillong as a last resource. The Shillong series of cases therefore may be looked upon as being mainly of the more severe type, the majority having had previous treatment without benefit or with subsequent relapse.

General Considerations—It was made a rule in the hospital that only those cases could be admitted for treatment which submitted to spleen puncture and in which the latter gave positive results on direct microscopical examination. All cases also were obliged to remain as indoor patients throughout the entire period of their treatment. When the latter was considered to be complete, and also during the course of treatment when necessary, spleen puncture was again performed in all cases where the spleen was still palpable. The material obtained from spleen puncture was subjected to both direct microscopical and cultural examination and the terms "Spleen puncture positive" and "Spleen puncture negative" denote respectively that one or

other method was positive in the first instance and that both were negative in the second.

Number of cases treated and the results of treatment—The details of cases treated are given below in tabular form. In all references to antimony salts the 1 per cent solution in normal saline solution is meant.

Routine treatment adopted—Knowles (1918) adopted as the routine treatment a course of 200 cc of 1 per cent solution of tartar emetic, presumably on the grounds either that 2 grammes was the limit of safety for the administration of antimony salts, or that the exhibition of this quantity was sufficient to bring about a cure in the majority of cases. This practice had been adhered to in this hospital until the present year, but accumulated experience has shown (1) that in the majority of cases uncomplicated by other grave constitutional diseases larger quantities of antimony salts may safely be given, (2) that a considerable proportion of cases which have received only 200 cc of the 1 per cent solution subsequently relapse. On these grounds it was decided in the present series of cases to lay down no hard and fast rule for the administration of treatment but to treat each case individually on its merits and to push the administration of the antimony salt used even until symptoms of intolerance began to appear. These usually took the form of pains in the joints and their appearance was considered an indication for the cessation of treatment, or at least the diminution of the dose. In the majority of adult cases these symptoms did not appear before 2 grammes of the antimony salt had been administered. In those cases where symptoms of intolerance appeared before 2 grammes had been administered, the administration was not stopped, but the dosage was increased more slowly and the time occupied in treatment subsequently prolonged.

The salt for the routine treatment was throughout the present series sodium antimony tartrate as prepared by Messrs Burroughs, Wellcome & Co and was used in a 1 per cent solution in normal saline.

Intravenous injections were given on every second day, commencing in the case of adults with 3 cc and proceeding to a maximum of 8 cc at a single injection. This maximum was generally reached at the 6th injection and was maintained at each administration until symptoms of intolerance appeared, when the treatment was discontinued or the dosage decreased according to the indications in individual cases. A certain proportion (36 per cent) of the cases showed no symptoms of intolerance to the drug throughout treatment, and in these cases administration was stopped when the patients were considered cured on general clinical grounds such as considerable gain in weight accompanied by good appetite, disappearance or great diminution in the size of the spleen, absence of fever for a prolonged period, improvement of the general blood condition, and negative microscopic and cultural findings.

Details of some special cases

Case XII—Male, aet 24 From heavily infected village in Kamrup Three brothers also had kala-azar Duration of the disease 3 years Treatment received was as follows—

1st year	100 c c	of 1 per cent solution of tartar emetic
2nd year	212 c c	of 1 per cent solution of tartar emetic
3rd year	154 c c	" " Sodium antimony tartrate

81.5 c c of 1 per cent formalin

Death in a condition of extreme emaciation Throughout the entire period of the illness parasites were always numerous in spleen punctures

Post-mortem—Abdomen contained several pints of perfectly clear fluid Intestines slightly injected in places but no gross lesions present Spleen weighed about 2 lbs Liver slightly enlarged and firm in consistence Lungs showed nothing abnormal Pericardium contained some fluid Microscopical examination of the organs showed an extraordinarily intense infection Spleen and liver were most heavily infected and the condition was uniform throughout their substance From calculations made from sections of these organs it was computed that the area occupied in a section by the parasites and the tissue proper of the organ was as 1 : 4 As the condition was uniform throughout the liver and spleen it follows that one-fifth of the volume of these organs must have been composed of parasitic substance

Two monkeys given one inoculation each of a mixed emulsion of liver and spleen from this case acquired acute and rapidly fatal attacks of kala-azar (Shortt, 1923) The chief interest of this case lies in the fact that prolonged treatment with antimony salts appeared to produce no sterilising effect as regards the parasites, which were present at death in greater proportion relative to the amount of tissue infected than we have seen in any other case.

Case VI—Male, aet 32 From heavily infected village in Kamrup Son died of kala-azar Duration of disease about 18½ years Treatment received was as follows—

1st year	400 c c	of 1 per cent solution of tartar emetic
2nd year	135 "	" " Sodium antimony tartrate

789.75 c c of 1 per cent formalin
20 c c of 2 per cent solution of 'trypan blue'

Throughout treatment the patient had an enormous spleen extending at one period to 4 finger breadths below the umbilicus and 2 finger breadths to the right of the middle line Throughout treatment the parasites of kala-azar were obtained on spleen puncture, both by microscopic and cultural methods As in other cases with very large spleens, the organs at times showed rapid fluctuations in size, within the limits of three or four finger breadths Such changes might occur within a period of a few days, and they seem to indicate that a considerable part of the enlargement of the organ in such cases is due to vascular engorgement, with the temporary relief of which the size of the organ rapidly diminishes The case left hospital with no improvement in temperature, or diminution in size of the spleen, and was apparently another instance of a case showing almost complete resistance to treatment

Case XXXI—Male, aet 30 From Gauhati No family history Duration of disease 10½ months Treatment received was as follows—

Patent medicines and Kaviraj treatment for first 8 months
72.5 c c of 1 per cent solution of Sodium antimony tartrate after admission to hospital

Death in a condition of extreme emaciation

This patient was a very advanced case on admission showing subnormal temperature, great emaciation, weakness, and anemia Parasites of kala-azar were numerous in the peripheral blood This case departed from the normal type in having no detectable enlargement of the spleen or liver On three occasions puncture was performed over the liver area, with the result on each occasion that no obvious liver tissue was obtained, but an opalescent fluid was withdrawn in quantity, and was

found to contain the parasites of kala-azar by both microscopic and cultural methods The patient died without manifesting any improvement but unfortunately a post-mortem examination of this interesting case was denied us

Case LIII—Male, aet 18 From heavily infected village in Kamrup Two brothers and one sister were also infected Two of these have died and one recovered under treatment The two which died are said to have been of the same type as this to be described below, i.e., with enlarged liver but with no enlargement of the spleen The one which recovered is said to have had enlargement of both liver and spleen

Duration of the disease to date 9 months Treatment received was as follows—

441 c c of 1 per cent solution of sodium antimony tartrate On admission, 6 months after onset of the disease the patient was very emaciated, with dry skin and typical hair The liver was enlarged three finger breadths below the costal margin No enlargement of the spleen could be made out Liver puncture gave positive findings Throughout the long treatment practically no amelioration of the general condition was obtained, and the liver remained enlarged, but after 379 c c of 1 per cent solution of sodium antimony tartrate liver puncture gave negative microscopic and cultural findings The patient refused to remain for further treatment

Drugs used other than Sodium Antimony tartrate—At the request of Lieutenant-Colonel E D W Greig, CIE, I.M.S., Director of Medical Research, Dr U N Brahmachari of the Campbell Medical School, Calcutta, was kind enough to send to us for trial in our cases two preparations of antimony, prepared by himself and in the use of which he had got good results These preparations were ammonium antimony tartrate, and urea stibamine Owing to difficulty of manufacture only very small quantities were sent and so a very limited number of cases could be treated The details of these are given below

Ammonium antimony tartrate—Three cases only were treated with this preparation Two had received no previous treatment The same dosage and method of administration were used as for the sodium salt The three cases were given respectively 303 c c, 260 c c and 121 c c (child) of a 1 per cent solution All the cases were discharged cured but the results were in no way superior to those obtained with the sodium salt

Urea Stibamine—Five cases altogether were treated with this preparation and, in our opinion, with most encouraging results As the results obtained in some at least of these cases were very striking the particulars of each case will be mentioned in some detail in Table II

The dosage employed by us, was that recommended by Dr Brahmachari, the solution for each inoculation being made up afresh The initial dose was 0.1 gramme dissolved in cold sterile distilled water Each subsequent dose, given on alternate days, was increased by 0.05 gramme until the dose reached 0.25 gramme which was not exceeded Thus the fourth and all subsequent doses were of 0.25 gramme As the preparation is precipitated from alcohol it is presumably sterile and on solution in cold sterile distilled water needs only warming in a water bath Administration was by the intravenous route

Showing the details of cases treated and results of treatment

Serial No	DURATION OF ILLNESS ON ADMISSION		Case No	Previous treatment if any	Duration of present treatment	Method of treatment	Results	REMARKS
	Years.	Months.						
1	not known	2	1	Sod Ant. Tart. 100 c.c.	18-1-22 to 22-4-22	Sod Ant. Tart.	Cured	
2	not known	not known	2	Do	21-2-22 to 10-4-22	Do	"	
3	2	7	3	Sod Ant. Tart. 200 c.c.	6-3-22 to 1-8-22	Do	"	
4	1	6	4	Do	8-3-22 to 10-5-22	Do	"	
5	1	4½	5	Do	17-3-22 to 6-6-22	Do	"	
6	1		6	Do	25-3-22 to 1-9-22	formalin 100% 789.75 c.c.	Discharged otherwise	
7		6	7	Do	28-3-22 to 16-4-22	2% Trypan Blue 20 c.c.	Died	
8		8	8	Do	1-4-22 to 18-7-22	Sod Ant. Tart.	Cured	Left before treatment completed
9		9	9	Do	1-9-22 to 5-6-22	formalin 100% 305 c.c.	Discharged otherwise	
10		7	10	Do	4-4-22 to 25-6-22	Sod Ant. Tart.	Cured	
11	3		11	Do	8-4-22 to 10-6-22	Do	Died	
12	8		12	Do	1-4-22 to 11-5-22	formalin 100% 81.5 c.c.	Cured	
13	not known	not known	13	Do	14-4-22 to 5-5-22	Do	Discharged otherwise	
14	not known		14	Do	18-4-22 to 10-5-22	Do	Died	
15		11½	15	Do	15-4-22 to 4-7-22	Do	Cured	
16		9½	16	Do	4-5-22 to 9-5-22	Do	Died	
17		9	17	Do	8-5-22 to 8-8-22	Do	Cured	
18	2		18	Do	10-5-22 to 7-9-22	Do	Relieved	Left before treatment completed
19		3	19	Do	21-5-22 to 22-6-22	Do		
20		5	20	Do	31-5-22 to 12-8-22	Do	Cured	
21		2	21	Do	5-6-22 to 21-7-22	Do	Died	
22		5	22	Do	12-8-22 to 7-7-22	Do	Cured	
23		1½	23	Do	12-8-22 to 8-8-22	Do		
24		9	24	Do	29-8-22 to 16-9-22	formalin 100% 547 c.c.	Died	
25		6	25	Do	30-8-22 to 31-8-22	2% Trypan Blue 124 c.c.	Cured	
26	1	1	26	Do	30-6-22 to 14-11-22	Sod Ant. Tart.	"	
27	1	4	27	Do	3-7-22 to 25-8-22	Sod Ant. Tart. 56.5 c.c.	Relieved	Left before treatment completed
28			28	Do	4-7-22 to 7-11-22	Sod Ant. Tart.	Cured	
29		8	29	Do	1-8-22 to 24-11-22	Do	Died	
30		7	30	Do	1-8-22 to 24-11-22	Ammonium Ant. Tart. 203 c.c.	Cured	
31		2	31	Do	12-8-22 to 30-11-22	Do	"	
32		9	32	Do	12-8-22 to 30-11-22	Do	"	
33		0	33	Do	12-8-22 to 30-11-22	Sod Ant. Tart.	"	
34		7	34	Sod Ant. Tart. 100 c.c.	28-8-22 to 5-12-22	Do	"	
35		7	35	Do	3-9-22 to 14-11-22	Do	"	
36		5	36	Do	3-9-22 to 14-12-22	Do	"	
37		5	37	Do	3-9-22 to 14-12-22	Do	"	
38		11	38	Do	3-9-22 to 14-12-22	Do	"	
39		2	39	Do	16-9-22 to 10-1-22	Urea stibamino 17 grammes	"	
40		6	40	Do	15-9-22 to 10-1-22	Sod Ant. Tart.	"	
41		3	41	Do	15-9-22 to 15-10-22	Do	Died	
42		5	42	Do	17-9-22 to 3-1-22*	2% Trypan Blue 42 c.c.	Cured	
43		8	43	Do	27-9-22 to 13-11-22	Urea stibamino 17 grammes	Relieved	Left before treatment completed
44		5	44	Do	29-9-22 to 14-11-22	Sod Ant. Tart.	"	
45		6	45	Do	29-9-22 to 14-11-22	Do	Cured	
46		5	46	Do	29-9-22 to 5-12-22	Do	"	
47		8	47	Do	7-10-22 to 1-2-23	Urea stibamino 1.7 grammes	"	
48		6	48	Do	4-11-22 to 17-1-23*	Urea stibamino 2.25 grammes		No parasites present on culture of spleen juice after 4th injection
49		7	49	Do	14-12-22 to 5-2-23*	Urea stibamino	Still under treatment	
50		6	50	Do	14-12-22 to	Urea stibamino		

Results of spleen puncture were tested by microscopic and cultural methods. The details of the cases treated are given below in tabular form—

Trypan blue—This drug was tried in two cases

Case XLVI—Male, aet 45 From heavily infected village No family history Duration of the disease

TABLE III

Showing results of cases treated with Urea Stibamine

Case No	Age	Duration of illness on admission	Result of spleen puncture	Amt. of urea stibamine after which spleen puncture was negative	No. of inoculations after which spleen puncture was negative	Total amount of urea stibamine administered	Wt in lbs before and after treatment	Results	REMARKS
43	22	11 months	+++	0.95 grammes	5	1.7 grammes	117½-133	cure	Case on admission was very ill with marked oedema of legs and great weakness
48	17	11½ "	+++	1.7 "	8	1.7 "	78-99	cure	Case on admission weak with oedema of feet Spleen puncture was not repeated before the eighth inoculation
56	15	6 "	+++	0.7 "	4	1.7 "	58-71½	cure	Case on admission emaciated weak and very anæmic.
57	40	9½ "	+++	1.795 "	9	2.295 "	93-110	cure	Case on admission was extremely weak, with very severe bronchitis Parasites very numerous
58	38	12	++	0.7 "	4	Still under treatment			Case had previously received full treatment with sod ant. tart without benefit

The perusal of the above table will at once show that although the amount of the drug available was only sufficient to treat five cases, the results obtained were so favourable as to encourage one to make a further extensive trial of this preparation. Its advantages over the antimony preparations usually employed as evidenced by our experience of it in these five cases are—

(1) The short course, occupying only 2-3 weeks necessary to complete a cure.

(2) The rapidity with which the symptoms of the disease disappear

(3) The fact that no symptoms of intolerance were met with in any of the cases

The results here recorded are actually much better than those claimed by Dr Brahmachari (1922) himself in the published account of some of his cases, where he gave as many as 20 injections

Formalin—Six cases were treated with intravenous injection of 1|1,000 formalin up to a total in one case of 189.75 c.c. The greatest quantity given at a single injection was 38 c.c. The results were disappointing, as the drug produced apparently no effect, either good or bad.

11½ months. The patient on admission was very weak and anæmic. Oedema of the feet and diarrhoea were present. The spleen extended downwards to the level of the umbilicus and the parasites of kala-azar were very numerous. As the patient had already received in the plains a course of treatment with tartar emetic lasting three months, presumably about 155 c.c. of 1 per cent. solution of sodium antimony tartrate—without any benefit, he was given intravenous injections of formalin, of which he received 547 c.c. of 1|1,000 solution. This produced no improvement so was discontinued. Trypan blue was then tried. A 2 per cent solution in distilled water was used by intravenous administration. Of this a total of 122 c.c. in 7 inoculations was given at intervals of five or six days. The greatest amount given at one administration was 25 c.c. Elimination of the drug appeared to be very gradual so that the effect was cumulative and the later doses had to be decreased compared with earlier ones. At the time of administration some giddiness and pains, chiefly over the spinal region, were complained of. No improvement in the condition resulted from the trypan blue and death followed a week after the last inoculation. At the post-mortem all the organs were deeply coloured with trypan blue and contained numerous parasites.

Case XLVII—Female, aet. 26 From heavily infected tea garden. No family history. Duration of the disease 4½ months. The patient on admission was very anæmic but otherwise her general condition was fair. The spleen extended to the umbilicus. No previous treatment had been received. Spleen puncture was positive to parasites of kala-azar. 42 c.c. of Trypan blue were given in three inoculations. No improvement was seen so

treatment was commenced with sodium antimony tartrate. The patient died suddenly from an acute renal condition. At the post-mortem no parasites of kala-azar could be found in any of the organs

Relapses after treatment with antimony salts

—In an earlier part of this paper it was observed that a large proportion of the cases treated by us were either cases which had relapsed or which had proved refractory to treatment with antimony salts. The statement has been made that cases which had relapsed after apparent cure were on that account more difficult to treat successfully with antimony preparations. Our experience in treating a considerable number of such cases has led us to the conclusion that there is no proof of this assertion. It is true that many such cases need prolonged treatment but the mere fact that they have relapsed shows that the previous treatment was insufficient to completely sterilise them and that in the first instance they would have needed a similar prolonged treatment. Such cases ought to be classed as inherently difficult cases to treat, and not as cases rendered so by relapse. The surest means, we feel convinced, of preventing such relapses is to treat cases individually on their merits, and to carefully avoid adherence to any fixed or standard dosage and duration of treatment, taking only as a guide the general condition of each individual case as revealed by ordinary clinical methods, supplemented by careful microscopical and cultural examination of the spleen if palpable, or of the liver in other cases.

Acidosis in cases of kala-azar—This condition was first described by Archibald (1914). It was thought by us that the correction of this condition might assist the other therapeutic means used in treatment. The method used to test the degree of acidosis present was the simple one of administering sodium bicarbonate until the urine was rendered neutral or slightly alkaline. Taking the amount normally necessary for an Indian as in the neighbourhood of 10 grammes, it was found that the amount needed for the cases of kala-azar averaged about 25 grammes. Sodium bicarbonate was then given daily to the patients in a quantity sufficient to keep the urine near the neutral point. No advantage accrued from this procedure and it was discontinued.

DIAGNOSTIC METHODS

Spleen puncture—For the preliminary diagnosis of a case, spleen puncture, followed by microscopical examination of the slide is the method of choice. Culture examination is seldom necessary for the first diagnosis because by the time the spleen is sufficiently enlarged for easy puncture parasites are sufficiently numerous to be easily found by direct microscopical methods. Cultural methods are indispensable but may be reserved for very doubtful cases, cases where the liver only can be punctured, and for the examination of spleen material from cases which are considered to be cured. In making spleen punctures the golden rule to remember is that blood should

not appear in the body of the syringe. In such a result when the parasites are few the actual splenic material is so diluted that the search for them is tedious.

The simplest procedure is to push the needle of a perfectly dry syringe well into the spleen substance, withdraw the piston some distance, and then, without waiting for the appearance of blood, to pull out the needle along its track with the piston held in the withdrawn position. The rapid pushing home of the piston will then discharge the small amount of splenic material on to a slide where it may be smeared out.

In making punctures to obtain material for culture, the syringe should contain about 0.5 c.c. of normal saline or citrated normal saline solution in order to facilitate the transference of the splenic material to the medium.

The administration of calcium chloride preliminary to spleen puncture has been practised by us as a routine procedure but we are not convinced that it is of any special advantage and we never hesitated to puncture a spleen even in cases which have been given no preliminary treatment.

Certain inferences can be drawn from the nature of the smear preparation obtained from spleen puncture.

Early cases, and those where the parasites are not very numerous, give preparations in which a considerable number of the parasite-containing cells are more or less entire.

In cases where the parasites are very numerous and evidently in an active state of division the great majority appear in the smear in the free condition. This is due to the fact that the parasitised cells are so numerous and so crowded with parasites, that the passage of the needle ruptures large numbers of over-distended cells from which the parasites are set free. As far as one may determine from sections of tissue the parasites never exist in the tissues in the free condition except as a very temporary condition due to rupture of an over-distended cell.

The formol-gel test—Our experience of this test is not sufficiently large for us to form a very decided opinion.

The great majority of our cases gave a very definite positive result, but in early cases and in some cases of malaria with a large number of parasites in the blood the results are sometimes misleading. In the former class of cases the result is sometimes completely negative, and in the latter results may sometimes be obtained closely resembling those given in cases of kala-azar. Where spleen puncture is not possible, however, it is a valuable aid to diagnosis.

In conclusion we wish to express our indebtedness to Lieutenant-Colonel T. C. McCombie Young, I.M.S., Director of Public Health, Assam, for assistance in obtaining for us suitable material from kala-azar treatment centres in the plains.

To Dr. Percy Foster, Medical Officer, Hautly Tea Estate, Badlipar, Assam, we are also greatly indebted for his kindness in sending us from ten

gardens specially selected cases out of the very large numbers which pass through his hands

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THE EVIDENCE OF CURE IN THE TREATMENT OF KALA-AZAR BY ANTIMONY

By F P MACKIE,

LIEUT.-COL., I M S

Director of the Pasteur Institute, Shillong, and of the kala-azar enquiry in Assam, and

SUB-ASST SURGN HARI CHARAN PATNI

THE value of antimony salts in the treatment of kala-azar is a well established fact, but by very reason of its efficacy practitioners are liable to overlook the fact that its action is by no means identical in different cases and that there is no hard and fast limit for its administration

We know now that the course of treatment at one time laid down as sufficient to cure is not always effective and that there is a fair proportion of cases which are very resistant to antimony, whilst in a smaller percentage still the drug as ordinarily administered has no appreciable effect either on the clinical course of the disease nor on the parasites which cause it

We doubt whether it is wise to accept any sort of standard of treatment, every case should be treated on its merits and it must be recognised that the only real criterion of cure is the inability to cultivate *Leishmania* on N N N medium from the material obtained by spleen puncture

We recognise that this ideal test is not generally available to those who are out of touch with a big laboratory, but nevertheless we are at a loss to indicate any clinical sign or combination of signs which can be guaranteed to indicate complete sterilization.

This fact is of great importance in estimating the value of the treatment campaign which is being carried on in Assam and elsewhere with much apparent success, for the supposed infallibility of antimony as a curative drug carries with it its own danger, which is imperfect cure and possibly the conversion of "cases" into "carriers"

As long as a person is known to be suffering from kala-azar his friends and fellow caste-men are inclined to look upon him with suspicion and in many cases subject him to some form of iso-

lation which is the first instinct amongst human communities to check the spread of disease

When, however, he has attended a hospital and has been discharged or has discharged himself as cured, all precautions are relaxed and he is received back to his village and hut as a healthy person. Before this may safely be done it is essential to know that the patient though apparently cured is not in reality harbouring active *Leishmania* in his viscera, which, for all we know to the contrary, are as liable to transmission as those from untreated cases

During the summer months of 1921 we had about fifty cases of kala-azar under observation and treatment in the small hospital attached to this Institute and it is from a study of these cases that we are able to draw some conclusions

Of the fifty cases, 36 remained long enough for a continued observation of their progress. Out of these seven died, two of pneumonia before the commencement of treatment, three of heart failure ascribed to antimony poisoning, one of erysipelas of the scalp and one who was admitted moribund from cachexia. A few left before completing treatment and some others had received irregular and unknown courses of treatment before they came under our care and are therefore excluded from consideration

The drug used throughout was sodium antimony tartrate and it is to this salt alone that our remarks are directed. We hope that before long a more efficacious and less toxic preparation of antimony will be available

The standards of cure hitherto accepted are either based upon clinical conditions such as those suggested by Rogers ("Fevers in the Tropics"), or have been based on the believed efficacy of a certain defined course of treatment

This latter is the one generally used in Assam and a "complete course of treatment" is taken to mean about two grammes of sodium antimony tartrate used in 1 per cent solution

This standard is apparently based on a statement made by Knowles (*Indian Journal of Medical Research*, Vol V 1917-18 p 546 *et seq*) wherein he summarises his experience in the following words, "a two gramme course distributed over three months seems to be a sufficient treatment to definitely sterilize an adult from parasites"

We believe both these standards, the clinical and the therapeutic, to be liable to error and shall quote cases from our series to shew this

We find that the only reliable standard of cure is the failure to cultivate *Leishmania* from the spleen juice on N N N medium. It is important to note that the microscopical examination of the material obtained for spleen puncture is not sufficient to determine the absence of parasites, for in the 13 cases we shew in Table II this method of examination was positive in 5 whilst in the remaining 8 the infection was only revealed by culture

Table I—Shews a series of seven cases which received about 200 cc of antimony tartrate and which passed our standard of cure

Case No	Age	No of cc of 1 % S A Tartrate	Spleen puncture, Microscopic and culture, both negative
2	21	202	Do
23	18	211 5	"
30	18	284	"
32	24	211	"
23	18	203	"
35	15	204	"
36	33	200	"

Table II—Shews those to whom 200 cc and over were given but were found to be uncured

Case No	Age	No of cc of 1% S A Tartrate	Spleen puncture Microscopic	culture results
1	23	212	-	+
4	19	208 (322 5 cc)	-	+
16	24	200	+	+
19	22	202 (303 cc)	-	+
37	18	207	-	+
38	24	296	+	+
40	10	399	+	+
41	34	300	-	+
43	24	210	+	+
45	22	213	+	+
48	20	204 (382 cc)	-	+
49	30	212 (417 cc)	-	+
50	24	200	-	+

The figures in brackets indicate the number of cc required before sterilization was effected

Nine other cases which do not appear in the tables received less than 200 cc for various reasons. Five of these were cured with 176, 127, 184, 173 and 134 cc respectively their ages being 15, 16, 25, 16, 25 years respectively, whilst four were uncured after 95, 77, 117, 137 cc and their ages 10, 8, 8, 35 years

Tables I and II shew clearly that in the majority of cases a course of 200 cc of a 1 per cent solution of antimony is insufficient to cure as this result was only obtained in seven out of 20 cases. The totally refractory case, a little boy of 10, shewed

living parasites after 379 cc, a dose equivalent in the adult to nearly 8 grammes

We now turn to the clinical aspect of the patient as a means of determining the probability of cure

The clinical signs which suggest that a cure is taking place are—

- the cessation of fever,
- increase in weight,
- reduction in the size of spleen,
- an increase in the total leucocyte count (especially that of polymorphonuclear cells),
- the physical appearance of well-being and the loss of the characteristic epidermal signs

We have tabulated the clinical signs of nine cases (Table III) all of which had a full course of treatment according to accepted standards but which nevertheless were found to harbour living *Leishmania* in their spleens

We will now make a brief reference to these signs individually

- Cessation of fever

In three out of the nine cases the course of the disease was apyrexial throughout, whilst in another three the fever ceased between the 4th and 10th weeks of treatment. In the remaining three the course of the fever was unaffected by treatment. Taking this sign alone six out of the nine cases might have been deemed to be cured

- Increase in weight

This occurred in most cases to a greater or less extent and in some cases was well marked. In two there was loss of weight and in both cases the pyrexia was unchecked by treatment

As a general rule the cessation of fever and rise in weight go together

- Reduction in the size of the spleen

This occurred in all except the totally refractory case No 40

- Increase in the leucocyte count

This was the rule in all except Case 40. A return to the normal count of about 7,000 per c mm is evidently no criterion of cure, for three of the uncured cases gave a normal count

TABLE—III

Case No	Age in Years	Weeks under treatment	Number of cc given	Pyrexia	Spleen size in inches		Leucocytes per c mm		Weight increase or decrease in lbs	Physical* Appearance
					Before	After	Before	After		
1	19	12	212	Only occasional small rises after 4th week	1	-	-	-	+ 14	+++
16	24	9	200	Practically afebrile throughout	5	2	-	-	+ 3	++
37	18	21	207	Fever ceased after 8 weeks	1	-	2100	7200	+ 2	++
38	24	21	296	Irregular fever throughout.	4	2	7400	5400	- 2	Not improved
40	10	22	379	Fever higher during last 5 weeks	4	4	2400	2300	- 2	Ditto.
41	34	10	300	Apyrexial throughout	1	-	4900	-	+ 17	++
43	24	24	210	Ceased after 10 weeks	5	1	2800	4800	+ 10	++
45	32	18	213	fever continued throughout.	5	3	3200	7900	+ 10	+++
50	24	16	200	Apyrexial throughout	4	-	3200	7200	+ 10	+++

* + + + = Appearance of perfect health.
+ + = Appearance much improved

(c) The loss of the characteristic epidermal signs, *e.g.*, rough, scanty and staring hair, darkening and roughening of the skin, together with a return to normal appearance are very valuable signs, almost more so than any others in indicating a probable freedom from infection

Three of the nine cases shewed this satisfactory appearance and were mentally optimistic and happy. Four others were very much improved in appearance and would have been described as cured judging from physical appearances alone.

Two cases shewed no improvement in these respects.

We have shewn in the above analysis that each of the signs pointing to cure may yet be associated with a condition of infectivity and, more than this, that several cases which gave every one of the clinical criteria of cure were shewn to be still harbouring living *Leishmania* and were therefore, potentially infective (*vide* cases Nos 1, 45 and 50).

In conclusion we think that these facts should be impressed upon those practitioners who are responsible for the treatment of kala-azar, especially upon those and they are many, who have been taught that a course of antimony almost automatically cures kala-azar —

I That the generally accepted "full course of treatment" namely 200 cc of a 1 per cent solution of sodium antimony tartrate is in many instances ineffective in curing the case

II That each case must be treated on its merits and a hard and fast limit of treatment abandoned

III That treatment should be continued till all or most of the clinical criteria of cure enumerated above are evident

IV That even when all these favourable signs are present the patient may still be harbouring living *Leishmania* and therefore the only real evidence of cure is the failure to grow the parasite from material obtained by spleen puncture.

V That microscopic examination of the spleen juice is, by itself, insufficient to prove cure

VI That there is a real danger to be apprehended from insufficiently cured cases as these may in all probability act as chronic carriers of infection in the community

We are indebted to Sub-Assistant Surgeon Biraj M D Gupta, a member of the kala-azar enquiry, for carrying out the cultural examinations referred to in this paper

THE GLOBULIN OPACITY TEST FOR KALA-AZAR.

By UPENDRA NATH BRAHMACHARI, M.A., M.D.
D.P.H.,

and

PARIMAL BIKASH SEN, M.Sc.

Some time ago one of us described two simple serum tests for kala-azar, which were named as

(1) the globulin precipitation, and (2) the globulin ring tests for the disease. The former consists of mixing one part of serum with two parts of distilled water when a distinct precipitate forms in the case of kala-azar serum. The latter consists of adding a few drops of distilled water on to the top of serum from a kala-azar patient when a distinct turbidity forms at the top of the serum. These tests have recently been confirmed by Milo, working in the University of Messina, and by some observers in China.

That the above precipitate is a globulin is proved by the following tests —

(1) It is soluble in normal saline, in dilute acids, in sodium bicarbonate solution and in sodium hydroxide solution

(2) It is precipitated from its solution in normal saline when the solution is treated with equal parts of saturated solution of $(\text{NH}_4)_2\text{SO}_4$ or when it is saturated with MgSO_4 or NaCl

(3) It is not precipitated by NH_4OH from its solution in dilute acids

(4) It is insoluble in distilled water.

We have subsequently found that if the globulin obtained by treating one part of serum with two parts of distilled water be dissolved in the serum of an individual on which formaldehyde has no action, an opacity is obtained if a drop of formaldehyde is added to it. If the same globulin is dissolved in normal saline, it also gives rise to an opacity or precipitate when formaldehyde is added to the solution, especially when the solution is rendered faintly alkaline by the addition of a little sodium bicarbonate. This opacity, however, is generally less than that which is obtained when formaldehyde is added to the original serum. It is probably due to the presence of electrolytes other than sodium chloride being present in the serum. There is no doubt that this easily precipitable globulin which one of us described some time ago in kala-azar serum is responsible for the aldehyde test.

THE GLOBULIN OPACITY TEST

By estimating quantitatively the amount of water-precipitable globulins present in a serum, we have succeeded in discovering a test which we propose to call the "globulin opacity test" for kala-azar. The test is carried out as follows —

One part of serum is mixed with six parts of distilled water when a turbidity forms. The precipitated globulin, after being uniformly mixed with the diluted serum, is poured into a graduated cylinder, the diameter of which is 1 inch. On looking through the height of the fluid containing the precipitated globulin over some black spots fixed to the bottom of the cylinder and adding more and more of the fluid till the spots become just invisible, a point is reached which gives an estimate of the globulin precipitated.

We have observed that in kala-azar a value is obtained which is fairly diagnostic of the disease, as will be seen in the following table —

	Precipitated globulin (1 part of serum + 6 parts of H ₂ O)	Height in inches at which the black spots disappear
Kala-azar		11
Do		14
Do		16
Do		07
Do		13
Do		075
Do		125
Do		075
Do		09
Do		085
Do		09
Do		125
Do		125
Do		125
Malarial fever		325
Do		3
Typhoid fever		35
Do		3
Pneumonia		2
Nephritis	..	42
Aneurism		54
Hemiplegia		5
Healthy student	above	8
Do do	do	10
Do do	do	10
Do do	do	10
Do do	do	10
Do do	do	10
Do do		65

NB—The height in inches at which the figures disappear is *inversely proportional* to the amount of the globulin present in the serum

From the above we may conclude that if, in any case, the height of globulin precipitated by diluting the serum with 6 parts of distilled water and estimated in the above way is 125 in or less, then it may be regarded as fairly diagnostic of kala-azar

We have also discovered that the total amount of water-precipitable globulins present in kala-azar is greater than that generally found in health or in other diseases. The total water-precipitable globulins are obtained by diluting one part of the serum with 200 parts of distilled water and estimating it in the same way as above

The following table gives the value of the total water-precipitable globulins in certain diseases

	Precipitated globulin (1 part of serum + 200 parts of H ₂ O)	Height in inches at which the black spots disappear
Pulmonary phthisis		31
Do do		39
Phthisis		315
Kala-azar		19
Do		145
Do		16
Do		175
Do		19
Do		15

Kala-azar	18
Do	135
Do	165
Do	14
Do	165
Do	125
Do	17
Do	135
Enlarged spleen (not leishmaniasis)	25
Dysentery	27
Do	25
Chronic dysentery	55
Liver abscess with broncho-pneumonia	29
Broncho-pneumonia with enlarged spleen	44
Broncho-pneumonia	39
Do do	24
Do do	37
Chronic bronchitis	35
Chronic rheumatism	44
Rheumatism	35
Mitral regurgitation	39
Influenza	37
Do	7
Do	7
Bright's disease	65
Pericarditis	63
Cancer	34

NB—The amount of the water-precipitable globulin is *inversely proportional* to the height in inches on the right hand of the table

CONCLUSIONS

(1) The easily precipitable globulins discovered by one of us some years ago are responsible for the aldehyde test. They are the same globulins that give rise to the globulin precipitation test and globulin ring test of one of us

(2) The total content of water-precipitable globulins is generally greater in kala-azar than either in health or other diseases

(3) A test has been described here, the *globulin opacity test*, for kala-azar. By this quantitative test a more definite serum test is obtained than any hitherto known

THIRTY YEARS' EXPERIENCE OF KALA-AZAR IN THE NOWGONG DISTRICT OF ASSAM

By J DODDS PRICE, M.R.C.S (Eng),
L.R.C.P (Lond),

As the title of this paper denotes it is mainly concerned with my thirty years' experience of kala-azar on the tea estates under my care in the Nowgong District of Assam

The first estate to suffer was attacked in 1893, and the disease slowly spread from estate to estate, the last to suffer being attacked in 1908. The measures taken to stamp out the disease were fully described by Rogers and myself in an article published in the *British Medical Journal*, February 7th, 1914, so beyond pointing out that these measures were uniformly successful I will only refer those interested in the history of kala-azar to that article. Though segregation measures eradicated the disease from the estates under my care, it must not be forgotten that 90 per cent

of all persons attacked succumbed to the disease, that for many years untold suffering and misery was witnessed daily, that the estates were put to terrible expense, that the means by which the disease was communicated was unsolved, that no curative treatment had been discovered, and the fact that a recrudescence of the disease from infected villages where preventive measures had never been adopted was within the bounds of possibility, was never lost sight of

In 1916 it became evident that kala-azar was once again assuming epidemic proportions in the Nowgong District of Assam. The majority of the cases were confined to the villages, and with the exception of one tea garden all the estates under my care were free from the disease. The tea estate referred to was surrounded by infected villages varying in distance from half a mile to six miles away. None of these villages were situated on estate soil and they were inhabited by Kacharies, Bengalis, principally ex-garden coolies, and Assamese respectively.

At a kala-azar conference held in Shillong towards the end of 1916, it was suggested that the Nowgong District should be surveyed with a view to ascertaining exactly to what extent kala-azar had recrudesced. The suggestion was given effect to by the Director of Public Health, and it soon became evident that kala-azar was very prevalent indeed. Many villages were removed to healthier sites, infected areas were notified, and by degrees special kala-azar dispensaries were opened wherever it was felt to be of urgent necessity. At these dispensaries intravenous injections of the salts of antimony were given to all who applied for relief and as far as possible sufferers were sought out in their homes and persuaded to come up for treatment, injections were also given at the various charitable dispensaries throughout the district.

Towards the end of my four years service as officiating Civil Surgeon, Nowgong, the majority of kala-azar patients gladly availed themselves of treatment by the new method. On my return from leave in January 1921 I was distressed to find that another estate under my care had a few cases of kala-azar, and since that time the disease has spread from estate to estate until there is now hardly an estate under my care that has not a few cases. On one or two estates the infection is a very heavy one indeed.

In connection with this recrudescence certain points are of interest. Once again it is the old coolie (old by length of residence, not necessarily in years) who falls a victim to the scourge and in many instances cases are receiving injections who were either small children at the time of the great outbreak on the Nowgong tea estates, or who were born as this outbreak was subsiding, the period of

greatest intensity being from 1897 to 1902. Once again the estate that suffered most severely on the previous occasion is now the most heavily infected, and it is not too much to say that but for the cure that Rogers has so fortunately placed in our hands this estate would be ruined. Coolies were at one time not difficult to obtain and gaps in the ranks were easy to fill, now coolie recruiting is almost at a standstill and very few new coolies are available. In the previous epidemic the mortality was over 90 per cent, no treatment was of any avail, and the sufferers in the course of dying infected many others. Now the picture is a much brighter one. Out of 112 cases receiving, or who have received injections on this heavily infected estate, there have been only 7 deaths which can be directly attributed to kala-azar, 57 have been discharged cured, and the majority of the remainder are doing light work and coming up bi-weekly for their injections. Further it is probable that while these cases are having regular injections there is little likelihood of their infecting others. In this connection it should be mentioned that before a cure was placed in our hands fever ran on unchecked for many weeks and cardiac irritability was frequently observed, being followed later by oedema of the face and feet. We get our cases now in the very early stages of the disease and many lose their fever after the 2nd or 3rd injection, and when they have been apyrexial for from 2 to 3 weeks, I am of opinion that light work is not only beneficial but assists in the cure. After all a tea estate coolie has little with which to occupy his mind and his capacity for sleep is usually prodigious, a task therefore that is well within his physical capacity and which will keep him in the open air for 3 or 4 hours a day surely must be of benefit to him. This estate is unfortunately situated in that the Government road runs through it from end to end, and the majority of the surrounding villages are heavily infected. These villages are inhabited by ex-garden coolies, Kacharies, Mikirs and Assamese. The experience of Rogers and myself in pre-antimony days was that if a kala-azar patient who had reached the typical advanced stage of the disease with great emaciation, once lost the fever, put on flesh steadily, and became well nourished, he or she never relapsed.

Although relapses are very few this cannot be said of the present method of cure. Relapses do occur after the patient has been discharged apparently cured from a clinical point of view, and I have had 6 cases in the past 12 months. These cases all relapsed within 3 months, but responded to a second course and are well to-day. The question arises then, is a course of 200 cc of 1 per cent sod antimony tart, sufficient? In some cases it is

evidently not sufficient. The saddest relapse I have seen was my last European case. Aged 42, he received his first course from Major Knowles (March to May 1920) and was sent home free from fever for many weeks. He relapsed in July and as I was in London at the time I gave him a second course to which he responded very satisfactorily and rejoined his family in Scotland. He returned to this country in January 1921, caught a chill (whatever that means) soon after leaving London, and was so ill on the way out that the ship's surgeon wished to land him. Fortunately there was a doctor on board, a mutual friend, who took charge of the case and brought the patient in much improved health to Calcutta. On arrival on his estate a third course of sodium antimony tartrate was administered, but although he responded once again, from that time on I was never very hopeful and Major Mackie who kindly saw the case with me in July 1921 agreed that the destruction of the leucocytes was so intense that recovery was out of the question. The patient died a month later, having been ill for 19 months and having had three full courses of antimony. It is interesting to note that he had an enlarged liver for over two years before he got kala-azar, that his spleen did not enlarge for many weeks after the initial attack, and that the chief incidence of the disease fell upon the liver which Major Knowles punctured in March 1920 and the resulting slide was found to be swarming with L. D. bodies.

Besides relapses we have to deal with two other types. A few undoubted cases of kala-azar respond but slowly to treatment and in the end slip through our fingers. They become anæmic, develop bowel trouble, which is most difficult to treat, kidney mischief often ensues, and they die in a more or less waterlogged condition. But the most distressing cases are those that die quite suddenly during the later stages of their course and often shortly before their cure is completed. I have seen 7 instances of this nature, 3 dying in convulsions, and 4 with a sudden rush of fever, having been quite free for many weeks, death taking place in 36 hours. In all these cases I have given the injection myself and faulty technique does not enter into the question. The drug used has in every case been the scale preparation of sodium antimony tartrate, 1½ per cent strength. These 7 deaths occurred in a series of 428 cases, a sum total of 9,416 injections being administered, the injections being given in every instance by myself and all attention to sterilization of syringe and solution injected receiving personal attention.

With regard to the frequency with which injections are made, no doubt bi-weekly injections are desirable, but are not essential to cure, as the following figures tend to show. On this estate owing to the exigencies of cir-

cumstances I am only able to inject the cases once a week and the results are quite as satisfactory as elsewhere, and no distressingly sudden death has occurred.

Number of cases	Cured	Died	Under treatment.
102	64	6	32

Of the 102 cases 71 are adults and 31 are under 15 years of age, 6½ per cent of the adult population being attacked and 10 per cent of the children. The cured cases are doing full work and are inspected once a month, all those still under treatment are doing well and the majority are on light work.

Now let me compare the cost to an infected estate during the first great outbreak, and the present expense incurred. It was estimated that each death from kala-azar of an adult coolie represented a loss of at least Rs 200/- . The coolie even in those days cost about Rs 120/- to land on the garden, and as it was the old acclimatized coolie who usually fell a victim to the disease he was worth considerably more than Rs 120/- to the estate. He lingered on for many months and though treatment was ineffective in almost every case, medicines and diet cost at a low estimate Rs 80/- a head.

Now, the majority of the cases are taken in hand at the earliest possible moment, they return to light work after a few injections, and it does not cost more than seven or eight rupees to effect a cure in, at least, 75 per cent of the cases. But admitting a vast improvement both from an economic and a health point of view, we must ever remember that on two questions we are still very much in the dark. What is the incubation period of the disease? How is the disease communicated? Until those questions are satisfactorily answered we must never relax our efforts, and it most certainly is not the time for the Government of Assam to try experiments with the Public Health Department.

In a recent leading article the *British Medical Journal* points out that it hardly seems credible that such a thing should have been thought of and rightly points out that to abolish the post of Director of Public Health and to hand his work over to already overburdened Civil Surgeons who cannot possibly spare the time necessary for the prolonged touring involved in carrying out efficiently kala-azar preventive work, is a penny wise and pound foolish policy. Those of us who have spent many years fighting the disease will heartily agree with the protest uttered by the *British Medical Journal*. When, however, the writer goes on to suggest that the proposal can only have been made because the generation of officials has passed away who had experience of the appalling epidemic in Nowgong of three decades ago, one is reluctantly compelled to dissent.

One of the officials concerned was Deputy Commissioner in Nowgong for some months at a time when kala-azar was raging on many of the tea estates, and he at least must be perfectly well aware what any relaxation of efforts to stamp out the scourge will result in. Any less efficient supervision and administration than at present obtains may well lead to recrudescence throughout the Assam valley, incalculable financial loss to Government and untold human suffering.

THE INCIDENCE OF KALA-AZAR IN BENGAL

By L. E. NAPIER, M.R.C.S., L.R.C.P.,
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THE last few years have seen a great revival of the interest of both the medical profession and the general public in the subject of kala-azar. Research work has been going on on this subject for the last twenty years, but as it is a disease that had no direct effect on the troops during the War the subject was naturally comparatively neglected during the years 1914 to 1919 and it is probably the return of research workers to this subject, as well as the signs of recrudescence of the disease in Assam, that are responsible for the present kala-azar "boom."

To the mind of the average medical man the word *Assam* immediately suggests the word *kala-azar* and, *vice versa*, the word *kala-azar* suggests the word *Assam*. One of the facts that has been brought to light during the last few years is the existence of an enormous number of cases of this disease in Bengal. It has of course been known for many years that kala-azar existed in many parts of Bengal, but the extent of the infection and the seriousness of the problem of kala-azar in this Province do not appear to have been recognised until quite recently, or if they have been recognised publicity has not been given to the fact and little has been done in the matter.

Now that the public press has taken up the matter and many inaccurate statements are being made, doubtless with the best intentions, by persons who are totally unqualified to make these statements, it will perhaps not be out of place to examine the evidence on the question of the prevalence of the disease in Bengal that we have at our disposal.

The only official figures that we have are those of the kala-azar survey that has been carried out under the Director of Public Health, Bengal, during the last few years. The survey naturally had to be a limited one, but the total number of villages that were examined was nearly 3,000 and one would have expected from this that a fairly accurate estimate of the number of cases in Bengal could have been made. The report of this survey suggests that there are 50,000 cases of kala-azar in Bengal and that the deaths from

kala-azar probably amount to 10,000 per annum.

Now a disease which affects only 1 in every 1,000 of the population and kills only 1 in 5,000 cannot be considered a very serious problem, nor can it appreciably affect the death rate in the province.

Although this report was not published 2½ years ago when I first came to Calcutta to work on the subject of kala-azar, the state of affairs that it shows coincides very accurately with the impression which I had got from other medical men and from the medical press of the state of affairs that existed in Bengal at that time. The prospect of a comparative shortage of clinical material made me wonder whether it would not be advisable for me to carry on a larger portion of my research work in Assam where I knew that clinical material abounded. In March 1921 I opened the kala-azar clinic at the Calcutta School of Tropical Medicine and from that time until the present my impression of the amount of kala-azar in the Province has had to undergo a continuous and rapid change. During the last twelve months I have seen in either the out-patient department or in the hospital about 1,000 cases of kala-azar of which only some 30 per cent were Calcutta residents. From this fact one can admittedly only get an "impression" of the number of cases of kala-azar in Bengal but this impression does not come anywhere in the region of 50,000. Those who know the rural conditions in Bengal must realise the enormous filtering process which necessarily occurs before the patients from distant villages arrive at the out-patient department of the School of Tropical Medicine. Many places in Bengal are 300 miles from Calcutta and the single railway fare, which from this distance would be equivalent to the value of a month's food for one man, would be absolutely prohibitive to a very large percentage of the population. This is only the smallest item of expense, there is the return fare to be paid, the fare both ways of at least one attendant and, the most expensive item of all, the cost of temporary residence in Calcutta. In many cases the money might be forthcoming if the patient were the head of the house himself, or even his eldest son, but the story would be very different if the victim were one of his less important dependents. What proportion of the patients realise that they have kala-azar and that this is a disease that can be cured if they are prepared to uproot themselves and go to Calcutta? Then, again, Calcutta is by no means the only place nor is the School of Tropical Medicine the only place in Calcutta where kala-azar is successfully treated, very large numbers of cases are treated by private practitioners, cases are admitted into all the other big Calcutta hospitals and since the opening of the kala-azar clinic at this School many of the other hospitals have also opened kala-azar out-patient departments.

Judging from my Calcutta experience only and taking all these factors into consideration I should

have said that there were at least a million people suffering from kala-azar in Bengal at present

My personal experience outside Calcutta is limited, but I have received a very large number of letters and have from time to time seen a large number of doctors from all parts of Bengal, and from everything that I read or hear I gather that my impression is not an under-estimate

Recently, however, an opportunity has arisen which has enabled me to get certain figures which may give a rough idea of the extent of the infection in the Province. Dr N Bhattacharji with some of his friends and a number of other voluntary workers have started a treatment centre for kala-azar in a village in 24-Parganas, some 22 miles away from Calcutta

Before giving the figures for this district it will be as well to consider whether there is any reason to suppose that the disease is more prevalent here than in other parts of Bengal. An analysis of the distribution of 738 cases of kala-azar (Napier and Muir, 1923) attending the out-patient department of the School of Tropical Medicine from all parts of Bengal made at the end of last year showed that, excluding the cases that came from Calcutta itself, the largest number, 103 cases, came from 24-Parganas, and this is what one would expect as Calcutta adjoins the district of 24-Parganas. The neighbouring districts of Hooghly and Howrah came next with 86 and 72 cases respectively. These two districts have a population of approximately a million each, whereas the population of 24-Parganas is over 2½ millions, or to get to actual figures, from 24-Parganas 39 cases, from Hooghly 80 cases and from Howrah 72 cases per million of population came for treatment, so that it will be seen that in the latter two districts there is probably more kala-azar than in the former. The distribution map of these cases shows that the number of cases coming for treatment from each district varies inversely as the distance of that district from Calcutta, as one would have expected; and that only one case found his way down from Mymensingh, a district which is known to be very heavily infected and which is shown in the report of the Director of Public Health as the most heavily infected district that has been surveyed. As it is not possible, however, to gauge the value of the distance factor the map is not of any real value as a guide to the distribution of the disease.

It must be admitted that there is little evidence to suggest that 24-Parganas is more heavily infected than other parts of Bengal although there is some evidence that it is not the most heavily infected district.

Dr Bhattacharji started his treatment centre on the 21st January, 1923, at Dogachua. On the first day 28 patients attended, by the end of the second month the attendance each day—(he visits the centre twice weekly)—was over 500, of which about 150 were new cases. The growth of the treatment centre was so incredibly rapid

that Dr Bhattacharji and his friends had the hardest work to treat the patients and found it very difficult to keep careful records of the villages from which they came and other details. By this time although the daily attendance of cases still continued to increase, the number of new cases that attended daily did not rise much above 150, so that with the help of a few additional workers who had come forward by this time, he was able to get this centre properly organised. A register was kept in which the name of each patient, the village from which he came, the diagnosis and the treatment that was given were entered. From every new patient that came blood was taken and the *aldehyde test* performed. If this test were "positive" a diagnosis was made accordingly but if it were "doubtful" or "negative" a diagnosis was made on the combination of the result of this test with the clinical history and the physical condition of the patient by either Dr Bhattacharji himself or by Dr Sen, his chief assistant.

The records showed that about 80 per cent of the cases that attended were cases of kala-azar. It is possible that in dealing with such large numbers mistakes were occasionally made, but on the days that I attended this centre and was able to see conditions for myself I found that between 60 per cent and 70 per cent of cases gave a strongly positive *aldehyde reaction* and it is therefore fairly certain that 80 per cent is not an exaggeration of the actual number that are suffering from kala-azar. As full details of all the cases from the beginning were not available I took for analysis the names of all the kala-azar cases for one day and all the new kala-azar cases for two subsequent treatment days (at the beginning of May). I made a spot map showing the distribution by villages of 613 out of a total of 670 cases. This map is here analysed in tabular form—

Distribution of Kala-azar Cases

From within a circle of 2 mile radius	184
From within a circle of 4 mile radius, but outside the 2 mile radius	230
From within a circle of 6 mile radius, but outside the 4 mile radius	179
From outside a circle of 6 mile radius	20
From villages which could not be identified	57
Total	670

That is to say 27 per cent of the cases come from within a radius of 2 miles, or an area of 12.5 sq miles, and 61 per cent come from within a radius of 4 miles, or from an area of 50 sq miles.

The total number of cases of all kinds that have come for treatment up to the middle of May is well over 3,000 so that one is perfectly safe in saying that at least 2,000 cases of kala-azar have been seen. The sample of 670 cases which we took for analysis was almost certainly a fair sample, so that we are now able to calculate that of the cases seen at the Dogachua

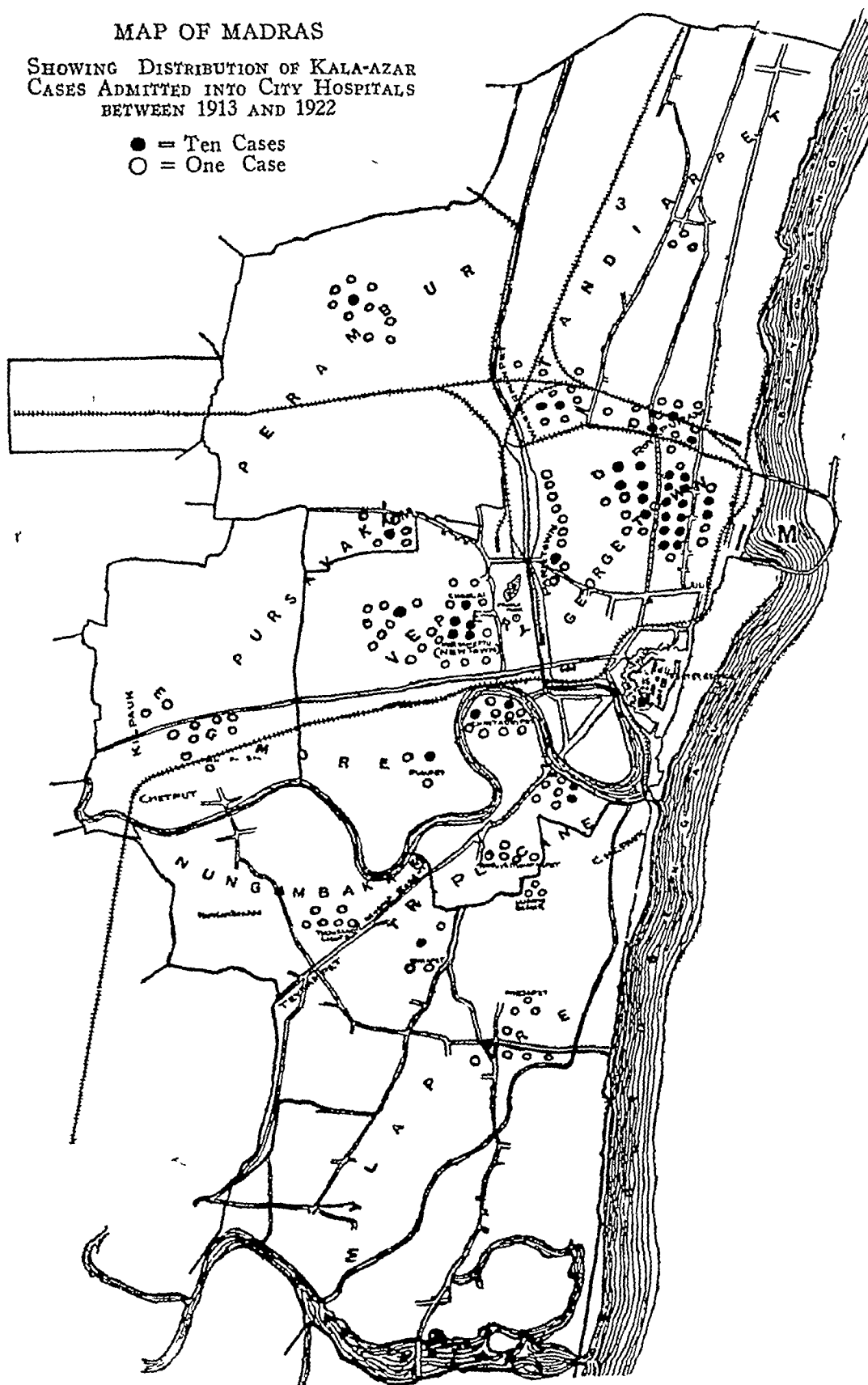
AN EPIDEMIOLOGICAL STUDY OF 663 CASES OF KALA-AZAR.

By Major J CUNNINGHAM, B A, M D, I M S and Dr P S VARADARAJAN, M D

MAP OF MADRAS

SHOWING DISTRIBUTION OF KALA-AZAR
CASES ADMITTED INTO CITY HOSPITALS
BETWEEN 1913 AND 1922

● = Ten Cases
○ = One Case



centre up to the present at least 540 come from within a radius of 2 miles, or from an area of 12.5 sq miles, and 1,220 come from within a radius of 4 miles or from an area of 50 sq miles.

It is probable that by this time very nearly all the cases that exist in the smaller area have applied for treatment at the centre during the four months of its existence, but it is quite possible that in the larger area (4 miles radius) there still remain a number of cases which have not yet come for treatment.

From the subdivisional officer of the Barasat subdivision I understand that the population of that subdivision is 738 per square mile and that this is the approximate population per square mile of the district included within a circle of a radius of six miles from Dogachia Railway Station, therefore, assuming that by this time every case of kala-azar in these areas has been seen, the

incidence in the smaller area is $\frac{540 \times 1,000}{12\frac{1}{2} \times 738}$
or 58, and in the larger area is $\frac{50 \times 738}{1,220 \times 1,000}$,

or 33, cases of kala-azar per 1,000 of population.

The total population of Bengal is 46 millions, so that if the incidence in the smaller area is accepted as being representative of the incidence throughout Bengal, the total number of cases must be not less than 2,668,000, or calculating from the number of cases in the larger area, not less than 1,518,000 cases.

The very great difference between my estimate of the number of cases of kala-azar in Bengal and that of the Director of Public Health requires some explanation. As the kala-azar survey was commenced some years ago and is now concluded, the first possibility that occurs to one is that there has recently been a very serious increase of kala-azar in the Province. This is not, I think, the case. The villagers do not say that there has recently been any special increase in incidence of the disease nor is there any marked increase recently in the death rate that would indicate this. One is forced, therefore, to conclude that one, or both, of the estimates is seriously wrong.

The possibilities of error in my estimate have been discussed. There are one or two directions in which it seems possible that there was an error in the kala-azar survey. The thing that attracted the huge numbers of patients to the Dogachia treatment centre was not their wish to satiate my desire to know how many cases of the disease existed in Bengal, but the hope that they would be cured. It is probable that unless this hope had been offered to the patients they would not have been so willing to show themselves. In carrying out the survey I believe that a number of spleen punctures were done and, harmless though this operation is if properly carried out, it is one which is never very popular amongst patients. Is it possible that the fear of this operation led to the concealment of a number of cases? The

statement that 80 per cent of cases showed parasites in the peripheral blood makes one wonder on what grounds the disease was excluded in those cases which did not show parasites in the peripheral blood. We have found in Bengal that by searching an average of $3\frac{1}{2}$ films from each case only 20 per cent of cases showed parasites in the peripheral blood.

This is not the time to suggest new and expensive schemes for either purposes of survey or treatment, but it a few voluntary centres, such as the one started by Dr Bhattacharya, could be started in other districts in the vicinity of Calcutta and if the Sanitary Department could organise and finance a few similar centres in other parts of Bengal, it might be possible to get nearer to the truth about the incidence of the disease in this Province and at the same time to commence to tackle a problem which I believe to be a much more serious one in Bengal than it is in Assam, on the lines on which the Public Health Department have worked for many years in the latter Province.

My thanks are due to Dr N Bhattacharya for placing the records of his treatment centre at Dogachia at my disposal.

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Appendix

AN EPIDEMIOLOGICAL STUDY OF 663 CASES OF KALA-AZAR ADMITTED TO THE MADRAS CITY HOSPITALS BETWEEN 1913—1922

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KALA-AZAR has been known to be prevalent in Madras City since the Leishman Donovan body was first described by Donovan in 1903 (1).

During 1911-1912 a definite investigation of the disease in Madras was carried out by a Committee especially appointed for this purpose. The results obtained from this investigation were embodied in a series of reports and papers (2).

One of these consisted of an epidemiological survey by Korke chiefly based upon a study of the Madras General Hospital and Royapettah Hospital records from 1904 to 1911. Since that date no exact information as to the prevalence of the disease or of any changes which may have occurred in the intervening period is available. It was thought therefore that a

most useful preliminary to any further investigation would be an enquiry into the epidemiology of the disease for the most recent ten-year period. In this way it was hoped that any change in the incidence or character of the disease occurring in later years would, if present, become apparent.

At the outset we were confronted with the same difficulty as that which faced Dr Korke, namely the impossibility with the staff at our disposal of making a complete and exhaustive search for all the kala-azar cases in the whole of Madras city during this period. Some practical index of these had to be sought. The cases which have presented themselves for hospital treatment offered the most convenient means of obtaining such an index. We have, therefore, following Korke's scheme, made a detailed study of all the hospital records found from the commencement of the year 1913 until the end of 1922.

We have supplemented this survey with visits to private medical practitioners in various parts of the city with a view to soliciting their interest in the problem and to obtaining their views as to the prevalence of kala-azar in the particular localities in which they are practising. These gentlemen have shown considerable interest in our inquiry, and have, in certain cases supplied information of considerable interest and importance in connection with the disease.

In selecting a hospital population, however, we are aware that such a class can by no means be taken as a true epidemiological sample of the population of Madras. In the first place it is natural that the hospitals, situated as they are in various areas, should tend to attract the people in the immediate neighbourhood to a greater extent than those more remote. Again it is only certain grades of the various communities which seek relief from the hospitals. These grades vary considerably with each class. Thus, the better classes as a whole seek private medical aid and only rarely come to the paying wards of the hospital. In certain communities too the females do not seek hospital aid if they can help it. The infection of a number of persons belonging to the same family is also a factor which must not be overlooked in this connection. On the other hand the improvements in diagnosis and treatment which have been introduced from time to time during the period under review are bound to have attracted patients and to have increased the hospital population especially in later years. Statistics dealing with annual incidence, age, sex, caste, etc., compiled from hospital figures must therefore be very carefully scrutinized and any conclusions based upon them accepted with caution.

Notwithstanding these limitations, however, certain facts, chiefly those relating to the dis-

tribution of the cases according to the districts they originally come from, are of great importance. In the first place, a study of the infected areas year by year will produce evidence as to whether the disease is on the increase or decrease, whether it is stationary, or gradually spreading to new localities. Facts dealing with age, sex, class, etc., vary considerably in the value which can be placed upon them but even here information of value can also be deduced in certain cases.

DISTRIBUTION OF THE DISEASE

Records of the four large Government Hospitals—the General, Royapettah, Royapuram and Maternity Hospitals—have all been examined. Those of the General Hospital were more or less complete for the whole period 1913-1922. In Royapettah the records were only available from 1917 onwards, with the exception of 1918 partially, and 1919. The records of the Royapuram Hospital are complete from 1919 onwards only. The Maternity Hospital produced only 7 cases, the Government Ophthalmic Hospital none. A total of 663 cases has been recorded in these Hospitals, of which 523 came from different parts of Madras City. One hundred and forty cases gave no detailed addresses and could not be located. Actual proof of the disease has been recorded in 148 of these cases only. The diagnosis of the remainder has presumably been made on the clinical picture alone, although it is possible that other methods have been utilised which have not been recorded. (See Table I.) The diagnosis in such cases has been accepted, but the possibility of errors in diagnosis in a certain percentage of these, especially in cases recorded in earlier years, must be borne in mind. It is probable, however, that the amount of error due to this source is not excessive, for the reverse process (*i.e.*, true cases of kala-azar not recorded

TABLE I
Tabulation of Kala-azar Cases Diagnosis
(1913 to 1922)

Clinical.		Discovery of parasite				TOTAL.
Symptomatic	Blood picture	Peripheral blood only	Liver puncture only	Spleen puncture only	N N Mo dium culture only	
351	209	33	75	32	8	708*

{ 79.2% } { 20.8% }

N.B.—In earlier years of the period of survey, laboratory methods of diagnosis were recorded in only a few of the cases.

* Includes 45 cases from out stations.

as such) must also have been in evidence. The figures as they stand therefore can probably be taken as a fair record of the true state of affairs during the period under review. In only 19 cases has a definite relationship with another case of the disease been recorded.

The accompanying map together with Table II gives the distribution of these 523 cases

TABLE II

Tabulation of Kala-azar Cases

Distribution of Patients according to the districts from which they came

Districts	Government General Hospital	Royapettah	Royapuram	Govt Maternity Hospital	TOTAL
George Town	172	21	21	1	215
Choolai	12	1	0	0	13
Chintadripet	19	7	1	0	27
Kilpauk	2	0	0	0	2
New Town	44	3	0	2	49
Egmore	4	1	0	1	6
Chetpet	2	0	0	0	2
Mylapore	5	2	0	0	7
Park Town	18	0	0	0	18
Perambur	20	1	0	0	21
Pudupet	5	6	0	0	11
Purasawalkam	10	4	0	0	14
Royapuram	23	3	11	1	38
Royapettah	2	9	0	0	11
Tandiarpet	3	0	1	0	4
Triplacane	9	25	0	0	34
Washermanpet	21	3	4	0	28
Vepery	16	0	0	1	17
Teynampet	0	6	0	0	6
Total	387	92	38	6	523
No address	108	6	26	0	140
Grand Total	495	98	64	6	663

according to the hospitals to which they were admitted and also the different divisions of the city from which they came. The majority of these cases have come from George Town, New Town, Royapuram and Triplicane. The deduction that these districts represent the most heavily infected areas is not justified however from the figures as they stand. The relative density of the population of the various areas must also be taken into account before any conclusions of this nature can be drawn. It must be remembered too that even after this has been done, the resulting rates will be subject to all the limitations and disadvantages already mentioned as inherent to figures taken from a hospital population, and that any conclusions drawn can only be accepted as generally applicable. We believe, however, that the figures do give us information which is of value.

Table III gives the average population in the different districts calculated from the census returns and corrected for the years 1911 to 1921. The incidence of kala-azar cases per 10,000 of population is also recorded for each district or collection of districts. As a result of this calculation we find that the area which includes New Town, Choolai and Vepery heads the list with a rate of 26.8 per 10,000. From the actuals it is apparent that New Town contributes chiefly to this high figure and is thus probably one of the densest foci of infection, at any rate amongst the class of the population which seeks hospital aid. Royapuram and Washermanpet give an incidence of 18 and 18.4 respectively, and George Town follows closely with an incidence of 17.7. Chintadripet and Pudupet show a rate of 14.3, chiefly due to cases from Chintadripet. Un-

TABLE III

Kala-azar rates for the various divisions of Madras City calculated from the corrected census for 1911-1921 and the Hospital admissions

Districts	Average Population corrected as per 1911-1921 Census Reports	Kala azar cases from all sources	Incidence per 10 000 Population	REMARKS
George Town	121,093	215	17.7*	* Hospital records do not distinguish between different parts of George Town and so one has to consider them as a whole.
Royapuram	21,088	38	18.0	
Washermanpet	15,188	28	18.4	
Park Town	20,604	18	9.0	
Tondiarpet	41,153	4	1.0	* New Town is included in this group and so a high incidence has been recorded
Perambur	26,115	21	7.3	
Purasawalkam	42,692	14	3.3	
Vepery with Choolai and New Town	29,393	79 { 49 New Town 13 Choolai 17 Vepery	26.8*	
Egmore	24,373	6	2.8	* So far no cases have been recorded
Kilpauk and Chetput	12,575	4	3.2	
Nungambakkam	15,639	0	0*	
Chintadripet and Pudupet	26,557	58	14.3	
Chepauk and Triplicane	70,009	34	4.8*	* Inclusion of Chepauk diminishes the incidence
Royapettah	34,959	11	3.1	
Mylapore and Teynampet	20,711	13 { 7 Mylapore 6 Teynampet	6.2*	* Inclusion of Teynampet increases the incidence
TOTAL	621,819	523	10.4	

fortunately the hospital records are not sufficiently complete to enable us to trace the cases to the individual wards in George Town. It has been necessary, therefore, to consider the division as a whole and it is quite possible that certain areas are much more heavily infected than others and might even compete with New Town for first place on the list. Detailed investigation on the spot will be necessary to find out whether this is the case or not. The remaining districts vary between 9 and 1.

There is also evidence in these districts that certain areas within the district itself show a relatively higher rate of infection than others. Thus Triplicane has yielded a higher number of cases than Chepauk, and the inclusion of Teynampet increases the incidence in the Mylapore-Teynampet area at the expense of Mylapore. No case of the disease has been admitted to the hospitals from the Nungambakkam area during the period under review. Thondiarpet, Egmore, Kilpauk and Chetput have also contributed very few cases. But here again the social condition of the population must be carefully considered before it can be said that the disease is rare in these areas.

George Town and parts of the neighbouring divisions is surrounded by separate and smaller foci of infection at different distances from the endemic centre which appear to have gradually become infected at a later period. The true explanation of the localisation of these smaller foci is probably to be found in the way that the City of Madras has gradually been built up. Madras originally consisted of Fort Saint George and George Town (or as it was originally called Black Town) with a large number of separate surrounding villages. These villages have gradually been absorbed as the town has extended its boundaries. The result is still apparent. Small collections of poor class houses are surrounded by larger houses with compounds occupied by the better classes of Indians and Europeans and even separated in some cases by rice fields. These small foci of infection correspond to the sites of the old villages and mark the places where the poorer classes are crowded together under conditions of overcrowding and bad sanitation.

The map of Audnai Thana in Assam published by Mackie (3) bears a close resemblance to

TABLE IV
Distribution of Kala-azar Cases in Madras per year per division

Divisions,	1913	1914	1915	1916	1917	1918	1919	1920	1921	1922	Total	Incidence per 10,000 population	REMARKS.
George Town	6	24	8	11	33	18	9	9	36	58	212	17.7	
Royapuram	2	1	2	1	4	2	6	5	9	7	39	18	
Triplicane	1	"			3	5		5	14	5	33	4.8	
Washermanpet	2	4	2	1	7	2	3	3	2	2	28	18.4	
Purasawalkam	1	2	1	1	1	1	1	1	2	4	15	3.3	
Choolai	1	1	1	2	2	1			2	4	14		
New Town	0	2	1	2	2	8	4	7	4	18	48	26.8	
Vepery				1	1	3	1	0	2	9	17		
Chintadripet		2	1	2	3	4	1	3	6	6	28		
Pudupet		1	1	1	0	2	0	1	4	2	12	14.3	
Park Town		1	1	3	4	3	0	2	1	4	19	9	
Perambur		1	2		1	2	1	3	2	7	19	7.3	
Royapettah		1		1	3	3	1		2	2	13	3.1	
Thondiarpet		1			1				1		3	1	
Mylapore					3		1	1	2	12	7	6.2	
Teynampet			"		3				1	1	6		
Kilpauk				1				1	2		2	3.2	
Chetput					1			1	1	5	8	2.8	
Egmore													
Nungambakkam													
Total	13	41	20	27	72	54	28	42	92	134	523		

Table IV shows the distribution of our cases year by year according to divisions and also according to the years that cases were first reported in them during the period under review. It would appear from this table that the most heavily infected areas are also those which have been infected longest. Our map, viewed in conjunction with the table, shows clearly the main facts which can be deduced from a study of these figures. A central densely populated endemic area represented by

our map of Madras. If our view of the formation of Madras city is accepted, then the similarity of the two maps is explained and it is more than probable that the same influences have been at work in spreading the disease in the two areas.

The full addresses of 225 out of the 523 cases were noted on the hospital record sheets. By means of these it has been possible to locate certain definite areas in the city which have been consistently contributing kala-azar cases.

for the past ten years. These areas include (a) Mannady in George Town (b) certain streets parallel to the Broadway (George Town) known as Venkatesa Maistrv Street, Mallappan Street and Sembudass Street, (c) certain houses round the Kacchaleswaran Temple and Tank Square (George Town), (d) certain houses towards the northern end of Mint Street—George Town, (e) First and Second streets of New Town. Of these the Venkatesa Maistrv Street and Mallappan Street have been so notorious for the high incidence of kala-azar between the years 1906 and 1912 that local practitioners report that the houses have been deserted and no one, however poor, will voluntarily occupy them. In addition to the above areas the records show that certain houses and lodging houses have recorded cases consistently for the past ten years. Until a more complete survey of these houses has been made further particulars cannot be given.

TABLE V

Divisional Distribution of Kala-azar

The records of the General Hospital and the Royapettah Hospital (1904—1911) in numerical order

(From Korke's paper)

Division	Population	Total cases of kala azar
1 George Town	142,803	563
2 Royapuram	78,073	103
3 Vepery and Choolai	71,299	194
4 Purasawalkam, Egmore and Podupet	23,717	81
5 Ohindripet	26,752	55
6 Triplicane and Mount Road	71,494	51
7 Perambur	24,979	32
8 Royapettah and Teynampet	34,353	23
9 Mylapore	20,234	21
10 Nungambakkam	11,751	15
11 Kilpauk	15,180	9

How do the facts which we brought forward compare with those published by Korke in 1912? Korke examined the records of 1,055 cases admitted for the period 1904—1911. This number exceeds the figures we have had at our disposal and this is probably due to the loss of the records in the Royapuram and Royapettah hospitals during the period we have reviewed. Unfortunately, the division of Korke's cases according to divisions does not correspond with ours (Table V). This appears to be due to the fact that the census returns for the Madras wards do not correspond with each other for the two periods. It is impossible therefore to make a detailed comparison of the two sets of figures. We have however, attempted to do this as far as possible. The two surveys correspond in all their main features. The central endemic area is the same in both, and Korke mentions cases

as coming from every one of the areas where cases have been recorded in our survey. So far the two surveys appear to be identical. Korke's investigation led him to believe that the only infective area was George Town and its immediate surroundings. Cases occurring in surrounding and more distant areas were according to him instances of infections leaving the infected area and settling down outside it. He states that the chief endemic focus of kala-azar roughly speaking is restricted to an area whose radius is nearly two miles and whose centre is the heart of George Town. We believe that this state of affairs no longer exists. The disease appears to have advanced to the extent that there is evidence that certain of these outlying foci, at any rate, are themselves now areas of infection. The outer fringe of infection has also apparently extended for amongst the 57 cases recorded as coming from outside the limits of Madras city, 9 have come from the villages of Saidapet and St Thomas' Mount some 6 and 7 miles to the south of Madras. These cases may possibly correspond to Korke's cases in outlying areas, but no evidence of this is available. We have been unable to obtain any evidence from our figures of a spread towards the north, although the cases we have recorded in Thondiarpet may be regarded as a possible extension in this direction.

INCIDENCE OF CASES ACCORDING TO SEX, AGE, ETC

The incidence of the disease according to sex, age and caste has also been examined. The total number of cases (708) admitted to the various hospitals between 1913—1922, as far as the information has been available has been utilised for this analysis. As no inference can be drawn from the caste or class incidence of kala-azar on account of the fact that the various castes differ in the extent to which they make use of the hospitals, the table dealing with caste incidence has been omitted altogether.

TABLE VI

Hospital admissions for kala-azar divided according to sex and race

Class or nationality	Males	Females	Total
Anglo Indians	114	96	210
Indians	392	106	498
Total	506	202	708*

* Includes 45 cases from out-stations

The incidence according to sex.—The incidence according to sex is given in Table VI and the cases have also been divided according to their race, whether Indian or Anglo-Indian. This division has been necessary for

the hospital figures derived from pure Indian sources cannot be relied upon to give a correct estimate. Thus the Indian female, particularly those belonging to the Muhammadan community, has a prejudice against going to hospital, which is not present to the same extent in the Indian male. No such prejudice exists in the Anglo-Indian community. We may therefore accept the figures derived from the latter source as representative of the relative incidence of the disease as far as the two sexes are concerned. No very great difference between the male and female admissions is to be observed in the Anglo-Indian figures. 114 males have been admitted as opposed to 96 females. The Indian figures on the other hand give a male preponderance of nearly 4 to 1. If the Anglo-Indian rate can be accepted as correct, as it most probably is, then a very large number of female cases have occurred amongst the Indian community in the city, which have either gone undetected or have been treated by private means outside the hospitals. Our incidence for the two sexes in the Anglo-Indian community does not agree with that given by Korke for the same community. He records 184 attacks in males to 86 in females or roughly about 3 to 1. It is difficult to explain this disparity between the two sets of figures unless a possible reluctance to enter hospital, of which there is no evidence, operated in the case of Korke's figures. On the face of it there does not appear to be any reason why females should suffer less than males, particularly in view of the accepted ideas as to the spread of the disease.

mate of the actual age distribution of kala-azar in Madras city. This agrees fairly closely with similar tables drawn up by other authors.

The youngest proved case recorded by us was a child of 6 months old who subsequently infected his own mother and was probably originally infected by the servants in the house.

CONCLUSIONS

1 A survey of 663 cases admitted to the Madras hospitals between 1913 and 1922 has been made.

2 This survey has been compared with a similar one made by Korke from cases admitted to the Madras hospitals between 1904 and 1911.

3 Both surveys show an identical area of maximum intensity in the neighbourhood of George Town surrounded by foci of infection arranged radially.

4 The available evidence tends to show that these foci, which were regarded at first as places to which kala-azar cases had migrated after infection, are themselves now foci of infection.

Cases have now been recorded in areas as far as 6 or 7 miles south of the city. These two observations would appear to indicate a slow and gradual extension of the disease since 1912.

5 The distribution of the disease with regard to sex, as far as Anglo-Indians are concerned, would appear to be about equal, males being slightly in excess.

TABLE VII

Tabulation of kala-azar cases

Age

Years	6-5	6-10	11-15	16-20	21-25	26-30	31-35	36-40	41-45	46-50	51-55	56-60
No of cases	29	71	156	147	94	84	38	33	14	14	4	5
Percentage	4.1	10.1	23.2	22	13.4	12	5.4	4.7	2	2	5	6

NOTE.—This table includes 45 cases from out stations.

Age—Social conditions, such as those which affect caste, do not apply to the same extent as far as age is concerned. The children of both sexes of all castes frequent the hospitals. It is only when the females reach the marriageable age that social customs prevent them from seeking hospital aid. Here again, if the distribution of the disease is more or less equally divided between males and females, as we believe it is, then the absence of the female will not affect the age incidence to any appreciable extent. We consider therefore that Table VII gives a fairly accurate esti-

6 The age incidence does not differ to any great extent from that observed by other observers.

The youngest case of infection recorded was in a child of 6 months.

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NOTES ON THE RESULTS OF TREATMENT OF CASES OF KALA-AZAR ADMITTED TO THE MADRAS CITY HOSPITALS BETWEEN 1913-22

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WE have analysed the results of the treatment of the cases admitted into the Madras City Hospitals between the years 1913-22 and we consider that these results are worth placing on record, if for no other reason than to demonstrate the great advance which has occurred in the treatment of the disease since the introduction of antimony salts for this purpose.

Seven hundred and eight cases have been recorded during the period under review. From the point of view of treatment these have been divided in the hospital records into the following groups—cured, discharged, relieved or otherwise, and died. In 53 cases the results have not been recorded. In the first Table we show the results of treatment year by year. Seventy-five cases died during the course of treatment. No less than 427 cases were discharged, not cured (*i.e.*, any stage between discharged, relieved and discharged otherwise) and their subsequent history is for the most part unknown. It is useless, therefore, to attempt to estimate the total mortality rates.

The percentage of cures year by year can be estimated but here again the figures must be accepted with a certain amount of reserve. The criterion of a cure must be defined—The majority of cases in an Indian hospital are lost sight of once they leave the hospital. In the present series, absence of fever for a certain period, diminution of liver and spleen to usual dimensions and increase in weight which has been maintained until discharge from hospital are probably all that can be claimed in the majority of cases. In a certain proportion an after-history of varying periods has been obtained. Thus four cases who were discharged cured have been recorded as under observation for periods varying between two and five years without any recurrence of symptoms. The treatment in each of these cases consisted of the intravenous administration of potassium antimony tartrate.

The great advance made in the treatment of this disease by means of antimony is well illustrated. This method was introduced in Madras in the year 1917 and all the cases admitted after 1920 may be taken as having been treated in this way. The pre-antimony period may be said to have continued until the end of the year 1916. The intermediate period containing cases treated in various ways, including antimony lasted from 1917 to 1919, both inclusive. In the pre-antimony period 132 cases have been admitted, two were discharged cured, 89 were discharged otherwise, 11 died, and of 30 cases nothing is known. In the post-antimony period 340 cases were treated with 106 cures, 172 discharged otherwise, 27 deaths, 16 result not known, and 19 still in hospital. Thus 2.2 per cent of the cases resulted in a cure in the pre-antimony days as compared with 34.7 per cent when antimony was the standard form of

TABLE A

Result of treatment of kala-azar cases divided according to years with reference to treatment with salts of antimony

Mode of discharge	1913	1914	1915	1916	1917	1918	1919	1920	1921	1922	TOTAL
Cured			1	1	10	8	8	19	47	40	134
Discharged relieved or otherwise*	10	36	12	31	61	53	47	50	82	40	427
Died	2	6	1	3	13	14	10	3	12	12	75
Unknown	2	7	8	13	3	4	—	8	5	19	53
Still in hospital											19
TOTAL	14	48	22	48	87	84	65	80	149	111	708

Percentage of cures		
Pre antimony period (1913-16)	Combined period (1917-19)	Antimony period (1920-22)
2	26	106
2.2%	11.3%	34.7%
Treated without antimony	Treated with antimony	
8	18	

NOTE.—Disappearance of fever, diminution of spleen and liver to normal dimensions and steady and continued increase in weight throughout the treatment have been taken as a definition of cure for the purposes of this investigation.

* A certain number of these cases left hospital before they had been completely treated.

treatment or, put in other words, 124 out of 134 cases or 92.5 per cent of the cases recorded as cured have owed their recovery to treatment with antimony salts. The potassium salt was used in the majority of cases, the sodium salt in a certain number, who proved unsuited to the potassium salt.

TABLE B

Results of treatment of kala-azar cases with various antimonial preparations

Mode of discharge	Potassium Antimony Tartrate	Sodium Antimony Tartrate	Stibenyl	Colloidal Antimony	TOTAL
Discharged cured	113	11			124
Relieved	70	3	1	2	76
Otherwise	35	2	3	8	48
Died	5	1	2	1	9
Total	223	17	6	11	257
Percentage of cures	50.67	64.70	0	0	48.25

NOTE.—Only cases who have gone through a full course of treatment are included in this Table.

The colloidal preparations of antimony and stibenyl have not found favour with Madras physicians. The percentage of cures recorded after treatment with antimony salts is 48.25 (see Table B). No cures were obtained with either stibenyl or colloidal antimony, but the number of cases treated otherwise than with potassium antimony tartrate is too small to form a basis of comparison.

KALA-AZAR IN THE MADRAS PRESIDENCY OUTSIDE MADRAS CITY

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LITTLE or no definite information is available regarding the incidence of kala-azar in the Madras Presidency apart from Madras City. No other endemic foci have yet been reported. In fact it has been generally believed that the disease does not occur in the Presidency unless some previous contact with a known endemic area had been established. Kala-azar is not one of the diseases mentioned in the Director of Public Health returns—(although a meeting held in 1919 of the Directors of Public Health has recommended that it should be so)¹—so that no information as to its prevalence is available from this source.

Donovan² in a review of the geographical distribution of the disease in India published in 1913,

mentions 5 cases as occurring in the Presidency outside Madras City. These cases came from Madura, Negapatam and Cuddalore. Korke³ mentions in addition one case from Trichinopoly and two possible cases from Mandapam. All these places are situated on or near the Eastern littoral. Major Cruickshank has given us details of a case which possibly had its origin in Cochin State in 1914. One case of kala-azar in Ramnad has recently been diagnosed by spleen puncture by the King Institute.

In the course of our investigation into the cases of kala-azar admitted into the Madras City hospitals between 1913–22 we have found the records of 57 cases which have come from places outside the boundaries of Madras City. In the absence of more exact data it appears to us that the analysis of these cases may be of value in that they give some information about the disease as it at present occurs in the Madras Presidency outside Madras City.

In 17 of these cases the diagnosis has been clinched by the discovery of the Leishman-Donovan parasite in the peripheral blood or internal organs. In the remaining 40 cases the diagnosis has been made on the symptomatology alone. We have already discussed the probable degree of error in this method of diagnosis from the statistical point of view. Certain other considerations arise, however, which tend to make the present series more satisfactory. In the first place a study of the case sheets clearly shows that there is a definite bias on the part of Madras physicians against the diagnosis of kala-azar in cases coming from mofussil stations unless definite proof in the shape of the discovery of the Leishman-Donovan body is forthcoming. Many of the cases have been recorded as chronic malaria until a change of diagnosis has been unavoidable owing to the development of the typical clinical picture. Secondly, improvement after specific treatment has been given is supplementary evidence of the correctness of the diagnosis, thus no reaction to continued quinine treatment with a subsequent history of improvement under antimony has been recorded in a definite proportion of the later cases. We consider therefore that the majority of these cases can be accepted as true cases of the disease.

We have arranged our results in the form of a table in which the places from which the cases have come have been grouped as follows—

- I Villages close to Madras City
- II Localities in the Madras Presidency
- III French India
- IV Localities in India outside the Madras Presidency
- V Localities outside India

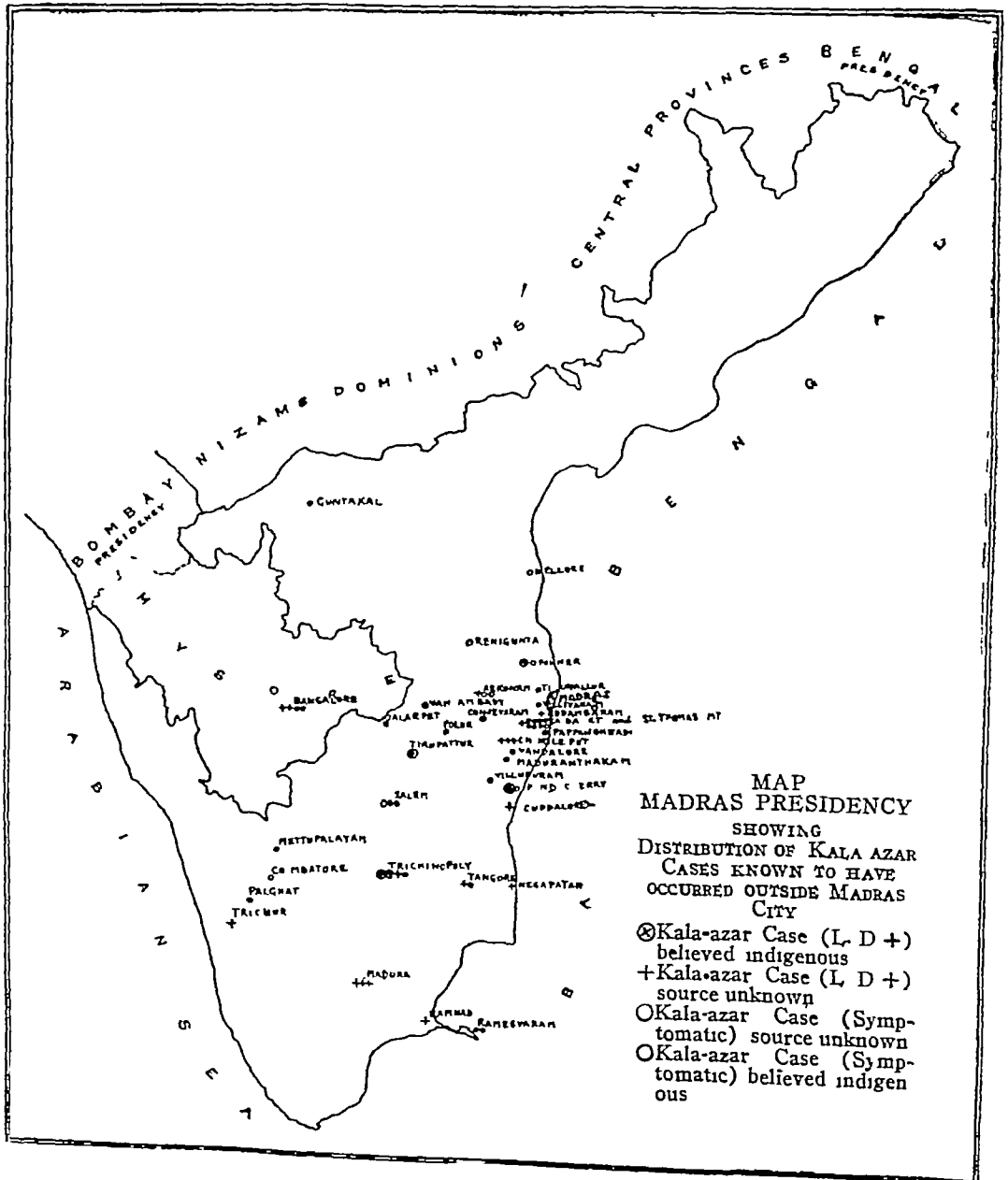
Lastly, we have also added a list of cases recorded from other sources.

The cases are also divided according to the method of diagnosis adopted in each. The occupation of the patients is also given.

KALA-AZAR IN THE MADRAS PRESIDENCY, OUTSIDE MADRAS CITY.

By Major J CUNNINGHAM, B.A., M.D., I.M.S. and Dr P. S. VARADARAJAN, M.B.

Map of Southern India Showing distribution of kala azar cases known to have occurred outside Madras city



In attempting to investigate the possibility of other endemic areas being present in the Presidency we are at once confronted with the difficulty that it does not follow because a case comes from a certain locality that it necessarily became infected in that locality. A detailed investigation into the previous movements of each case is necessary to see if there is evidence of earlier residence in a known endemic area. Col Elwes believes that a history of some such connection can be obtained in the vast majority of cases of this sort. When such contact has been proved, however, the minimum residence in an endemic area necessary to produce an infection must be a factor of the greatest importance, and here unfortunately our present knowledge of the disease is insufficient to produce a satisfactory answer. Cruickshank's case may be cited as an excellent example of this difficulty. A young planter resident in Cochin was found in June 1913 to be suffering from severe malignant malaria as proved by blood examination. He was seen six months later at Coonoor when no malarial parasites were found but Leishman-Donovan bodies were found on spleen puncture. He had been three years in India in business near Trichur, and, with the exception of a week in Calcutta in 1912, with a night in Madras going and returning he had never been out of the district. In this case a maximum of 7 days was spent in an endemic area. The question arises whether this case was infected in Madras or Calcutta, or in Cochin. If the former contingency be accepted than a very small exposure may result in infection. The known facts about the epidemiology of the disease, however, are more against than for such rapid infection. In the present series of cases it has been for the most part impossible to trace the actual source of the infection. On the other hand with a few exceptions, it has been equally impossible to obtain evidence of no previous connection with the known endemic area.

A glance at the map will show that the majority of the cases came from places within easy reach of Madras, and that it is more than probable that direct connection with the Presidency town must have occurred at one time or other. This is certainly so in the case of railway centres such as Arkonam and Guntakkal where the patients chiefly belong to the railway colony. The fact that only single cases have come from such a large number of the localities would point to the same conclusion. In the case of towns more distant from Madras the connection is more difficult to establish, but even here evidence of immigration, which possibly exposed the patients to infection, can be obtained in a certain proportion of cases. Thus one case from Salem had previously been in the Federated Malay States and so would almost certainly have had to pass through Madras. On the other hand, it is difficult to understand how ryots or coolies in these localities could be infected unless the latter were working at railway stations and had got infected by casual connection

with infected persons or their belongings. This explanation on the face of it appears to be somewhat far fetched. Only 4 or possibly 5 cases in the series give a definite assurance that they had not been away from the locality for several years before they first became ill. These cases came from the following places —

1	Trichinopoly	2 cases
2	Ponneri	1 case
3	Tirupattur	1 case
4	Pondicherry	1 case (doubtful)

The Leishman Donovan parasite was found in the first three of these cases. There is no doubt therefore as to their authenticity. The other two cases were diagnosed from the clinical picture alone.

The analysis of the present series of cases seems to show that the majority have probably been infected by some contact with Madras, the known endemic area for South India. The evidence obtainable in favour of the existence of other endemic areas is very small.

The facilities of inter-communication between Bangalore and Madras, and the fact that three out of the four cases coming from that town belonged to the Anglo-Indian community who are more likely to have availed themselves of these facilities, would operate against Bangalore being an endemic centre. There is a probability that Trichinopoly and perhaps Pondicherry may have originated cases of the disease. The fact that one case has been previously reported by Korke as originating in Trichinopoly favours this view as far as that town is concerned.

Further evidence, however, will be required before a definite opinion can be given on this question. Ponneri may be a small secondary focus of infection to Madras. No further cases have come from Madura, Cuddalore, Negapatam or Mandapam, localities from which Donovan and Korke recorded cases in 1912. The disease has apparently not established itself in these places, and they may therefore be disregarded as possible endemic centres.


It must be remembered, however, in considering these conclusions that the present communication only takes into account cases which have been admitted into the Madras hospitals. Infections may have occurred which have been treated elsewhere and of which we have no record. The present investigation merely serves to give an indication of the condition of affairs in the Madras Presidency so far as the evidence is available to us. No final conclusions can be reached until a complete and detailed survey of the Presidency is made.

The case which came from Bagdad is of interest in connection with the reports of two cases made by Kulz¹ and Low² and Balfour³ and Ledingham's⁴ remarks thereon. This man was a ward-boy by profession. He had an attack of fever lasting for a fortnight while in Bagdad, which was thought to be enteric. The fever disappeared for a time but his spleen and liver had been

TABLE
SHOWING DISTRIBUTION OF KALA-AZAR CASES KNOWN TO HAVE OCCURRED OUTSIDE MADRAS CITY

A—Hospital cases

	Places	Occupation when known	L-D Parasites present	Symptoms	Total	REMARKS.
I—Localities in the immediate neighbourhood of Madras city.	Tiruvallur	Student	1	1	1	
	Villivakam	All cases females		4	4	
	St Thomas Mount.	1 Fisherman (a)	1	4 (a b)	5	
	Saidapet	1 Peon (b)	1		1	
II—Madras Presidency	Kodambakkam		1		1	
	Guntakal	Fireman		1	1	
	Nellore	Ryot		1	1	
	Renigunta	Beggar		1	1	
	Ponneri	Servant (c)	1	1 (c)	2	
	Aikonam	Guard's child		3	3	
		School boy				
		Driver				
	Vanniyabody	School boy		1	1	
	Conjeevaram			1	1	
	Jalarpet			1	1	
	Polur	Cooly		1	1	
	Pappanchadi	Milkman		1	1	
	Chingleput	School boy	3(d)		3	(d) One case had previously been in Federated Malay States
	Vandalore	Ryot		1	1	
	Maduranthakam			1	1	
	Tirupattur			1	1	
	Vellupuram	Cooly		1	1	
	Trichinopoly	1 clerk (e)	2	1	3	(e) One case had been in Basra 2 years previously.
	Tanjore		1	1	2	
	Mettupalayam	Cooly	1	1	2	
	Coimbatore	Priest		1	1	
	Palghat	Cooly		1	1	
	Salem			3 (f)	3	(f) One case had been in Federated Malay States previously
III—French India	Pondicherry		1(i)	1	2	(i) Had spent some time in Calcutta
IV.—Other localities in India outside Madras Presidency	Bangalore	1 Female	2	2	4	
	Assam			1	1	
	Calcutta	School boy	2		2	
		Clerk				
	Patna	School girl	1		1	
V—Places outside India	North West Frontier	Telegraphist		1	1	
	Singapore and Federated Malay States	Fitter Overseer	1	1	2(k)	(k) Both resident in Madras at the time.
	Bagdad	Ward Boy		1	1	
<i>B—Cases reported from other sources</i>						
Donovan	Madura		3		3	
	Negapatam		1		1	
	Cuddalore		1		1	
Korke	Trichinopoly	Beggar	1		1	
	Mandapam			2	2	
Cruickshank King Institute	Trichur	Planter	1		1	
	Ramnad		1		1	
TOTAL					67	

Note— round the figures means a probable indigenous case

gradually enlarging ever since. He was diagnosed as kala-azar from the clinical picture and was treated with antimony with good results.

CONCLUSIONS

There is no conclusive evidence of any other endemic focus of kala-azar in Southern India apart from Madras City. Cases of the disease may possibly have originated in Trichinopoly, Ponneri and possibly Pondicherry and Bangalore, but, so far as the evidence before us goes, they cannot be considered at present as definite endemic centres of the disease.

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IODINE IN THE TREATMENT OF MALARIA, KALA-AZAR AND SMALL-POX

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READERS of the *Indian Medical Gazette* may remember a paper which I published in 1914 on my experience in the treatment of cholera with iodine. Since then I have used iodine exclusively for cholera and have struck nothing better.

On return from military duty to civil employment in January 1921, I was faced by an embarrassing problem, there was a general hue and cry from all quarters that the district was being depopulated by malaria, and every one was shouting for quinine and more quinine, and the difficulty was that at that time there was a shortage of Government quinine and what could be got was being sold at Rs 49 or Rs 50 per pound. Worse than ever, as the price of quinine had gone up, our funds had inversely gone down. It very often happened that such money as we could raise was sent back with a note that there was no quinine in stock.

In consequence of this state of affairs I had to look about for a substitute, and the first thing I did was to turn to iodine which had served me so efficiently on several other occasions in cholera, small-pox, influenza, intestinal colic, diarrhoea, dysentery and a host of other complaints with which I shall deal with later. The results were most gratifying. And now in the Suri Jail quinine is a thing of the past, and iodine has practically taken the place of all other drugs for the

treatment of fevers, bowel complaints, and septic conditions.

Owing to long ingrained prejudice, I have not enforced the adoption of my practice in the Sudder Hospital or the Police Hospital, where quinine is sometimes used, but this is gradually dying down as results become apparent. In the district and out-lying dispensaries, owing to the same prejudice, I have found a good deal of difficulty in persuading my assistants to depart from the beaten track of prescribing fever mixture for fever, or astringent mixture for diarrhoea, or triple powder for dysentery. These people will admit that quinine is the correct thing for malaria, but they will go on prescribing fever mixture for days and sometimes for weeks, whilst waiting for an opportunity to obtain quinine, in the meantime calling the disease by such euphemistic terms as typhoid remittent, or typho-malaria, and when they do prescribe quinine it is usually in doses that have no effect and which amount to a waste of good money. It has also been my experience that the patient of these days is not satisfied with his doctor unless he prescribes some preparation with a high sounding name such as novarsenobillon or hormotone whereas the ordinary household remedy iodine is far too commonplace to be accepted.

Malaria as it exists to-day may be regarded as the greatest scourge that has ever existed in India. India by virtue of being an agricultural country encourages the spread and endemicity of malaria. It is the masses in the villages that are affected most. It is the poor that suffer most. And it will take ages and ages to educate the masses to protect themselves from its attacks. So the next best thing to do is to give the individual a remedy that will cure him when he has actually been attacked. And that remedy must be accessible to rich and poor alike.

The medical profession universally believes that quinine is the only antidote for malaria, and it seems almost ludicrous to try and supplant its leading position, more especially with such a commonplace drug as iodine, which for generations has been regarded as a poison internally, and an anodyne externally. In fact when about a year ago I mentioned to some of my medical friends in Calcutta that I was using tincture of iodine for the treatment of malaria, some of them looked at me in such a way as if to imply that they regarded my sanity with some suspicion.

All authorities agree that nothing less than 20 grains of quinine per day is of any use in the treatment of an adult suffering from a malarial attack, some are in the habit of prescribing 10 grains three times a day. It is also suggested that to properly treat an attack of malaria the victim should undergo a four months' course before he can be safely considered cured. Where, outside the army, is such a thing possible? Even if our benevolent Government could afford to provide all the quinine that is necessary and were to enlist an army of

conscientious enthusiasts to distribute the quinine to the stricken, only about one per cent of the afflicted would turn out on the first day to receive it and in the course of a week none except those who were actually suffering from fever would turn up at the distribution centres. So it is obvious that this expensive, prolonged and disagreeable method of treatment should be replaced by something which does not require an army of enthusiasts, which will be less expensive and last but not least will be less disagreeable.

Quinine costs Rs 30 per pound nowadays, whereas tincture of iodine costs about Re 1 per pound.

Quinine is given in ten grain doses three times a day, and a course of treatment should last over four months. Tincture of iodine has been given by me in ten drop doses, three times a day, and need be continued for about ten days only. Taking the dosage and time of treatment as equal for argument's sake, then for the cost of every patient treated with quinine, thirty patients could be treated with iodine.

It has been my experience that unless spontaneous recovery occurs, which sometimes happens even with no quinine at all, an ordinary attack of malaria with a week or ten days' treatment often relapses. I have found that an attack of fever treated with iodine does not relapse. Cases that resisted oral treatment with iodine up to the fourth or fifth day, were given one or two intravenous injections of a quarter grain of iodine, which was sufficient to bring the temperature to normal and to keep it there.

Quinine as a drug is positively abhorred by all for its taste, and dreaded by most for its after-effects. Iodine has nothing objectionable in taste, nor have I even seen any undesirable physiological effects follow on its use.

All the above-noted points are worthy of consideration.

In the Suri Jail hospital in 1921 I had 73 admissions from malaria and several of these were relapses. In 1922 when iodine was the routine treatment for all fever cases, I had 23 admissions and no relapses. It may be noted that quinine as a prophylactic had been discontinued altogether during 1922.

I could subjoin a few dozen case-sheets and temperature charts to illustrate my contention, but they are all very much alike, and I feel sure would serve no useful purpose, and take up an unnecessary amount of space. A number of these case-sheets and temperature charts were shown to Dr Bentley, Director of Public Health, Bengal, and Colonel Hamilton, I.M.S., Officiating Inspector-General of Prisons, at their visit to Suri.

One interesting fact has come under observation in the jail. A patient who had been admitted several times for fever *before* I started the iodine treatment, had a relapse and had to be admitted into hospital *after* I had started the iodine treatment. As was now the routine treat-

ment he was put on to ten drops of iodine three times a day, but to my disappointment after seven days of iodine his fever continued unabated. This man's blood films showed innumerable crescents, so I concluded that perhaps iodine had no effect on crescents, and fearing that I had lost a considerable amount of time already, and feeling badly beaten, I very reluctantly reverted to quinine and his temperature dropped to normal in twenty four hours. Of course this might have been due to the quinine or to the cumulative effect of the iodine or might even have been an instance of spontaneous cure. But not caring to subject the patient to any risk I continued the quinine for a week, after which I gave him three intravenous injections each of half a grain of iodine once a week, and now it is 8 months since he has had any treatment and he has had no relapse, as was formerly the case.

KALA-AZAR

The above results and a few others where the spleens were enormously enlarged and where malarial parasites were not found led me to try the iodine method in cases of kala-azar with the happiest results. And though the present antimony method is an accepted fact in the treatment of kala-azar I beg to submit that the weeks and months of monotonous waiting, sometimes—indeed—to no purpose, become wearisome and intolerable to the sufferer, and to his friends and relations, who often lose heart and abandon the treatment long before recovery sets in. With this fact in view, I hasten to lay before the profession a resume of my experience and observations in the treatment of kala-azar with iodine by the mouth and intravenously, with a view to lose no time and with the hope that some of the workers interested in this subject who are better provided with material, equipment and facilities will put the method to the test and express their verdict.

The method is as follows. I prepare the following solution—

Iodum	grs 6
Pot Iod	grs 6
Aqua distillata	oz 1

40 minims of the above solution contain half a grain of iodine. This quantity is injected intravenously every other day up to five injections and then ten drops of tincture of iodine is given by mouth three times a day for a week. Before the fifth injection has been given there appears a marked diminution in the size of the spleen. Nourishing food and tonics may be given to complete recovery.

My thanks are due to Dr Harendra Nath Sen, who has carried out the spleen puncture and aldehyde tests, and to Dr Nagendra Nath Das Gupta of the Jail hospital and Dr Aghore Nath Das of the Police hospital, who have carried out the treatment and have kept records.

It has been our experience that the serum taken from a blister also coagulates with formaldehyde in cases where the blood serum is positive, but is not affected in cases where the blood serum is negative

SMALL-POX

Since 1913 I have been using tincture of iodine externally and internally in the treatment of small-pox. The benefit of this method was first evidenced in an epidemic of small-pox, which broke out in the town of Suri in 1913, when I was the Chairman of the Suri Municipality. I, with my Sanitary Inspector, used to visit every house where a case of small-pox had occurred and paint the patients with tincture of iodine twice daily. And to some of the very bad cases who consented to take internal treatment a mixture of ten drops of the tincture was given to be taken three times a day. It is probably known that most of ignorant patients regard an attack of small-pox as a visitation from the spirits, and do not like to take any treatment that will interfere with the will of the spirit. In a previous epidemic in the town 175 cases had occurred and there had been 75 deaths. On this occasion there were only 35 attacks and no deaths. The most marked feature about the treatment was that in no single house affected did a second case occur, whereas in one house where the patient had homeopathic treatment there were three more cases. In subsequent years whenever small-pox broke out in any locality I provided the Inspectors and Sub-Inspectors of vaccination with a bottle of iodine each and sent them out. They always reported most satisfactory results.

Recently when I was stationed in Lucknow, small-pox broke out in epidemic form amongst the men of the 10th Middlesex Regiment. Having had some experience of small-pox I was put in charge of the small-pox ward. I used tincture of iodine freely and with the happiest results.

My experience is that the free use of iodine at any stage of the disease cuts short the attack, reduces its virulence, and renders it absolutely innocuous. Knowing how the poorer class of Indian live and how loath they are to part with their bedding and quilts, I have found that where iodine has been used freely no other persons in the house have been infected, which I am inclined to think is due to the iodine completely sterilising the patient and his bedding. Another feature is that the patients treated with iodine before the suppurative stage sets in do not pit, even others treated in the later stage pit very slightly.

CARBUNCLE

Iodine has been used for a long time as an application for boils, whitlows and carbuncles. But recently I had two very bad cases of large carbuncles one on the side of the neck, and another on the back. Free incisions were made, but in the neck case it was considered inadvisable to go very deep. So instead half a grain of iodine was given intravenously, the effect was like magic.

DYSENTERY AND DIARRHOEA

It is now the routine practice at Suri that when a case of bowel trouble is admitted into the Jail Hospital, he first gets a dose of castor oil, which is followed by tincture of iodine ten drops three times a day. He never needs any other treatment. There used to be in Jails what is known as the post-dysentery gang. This used to be considered very necessary in former days. But since I started the iodine treatment I have done away with this and we have had no ill effects.

GONORRHOEA

It is far too early to pass a verdict in this disease, but recently I received into the Jail an under-trial prisoner suffering from a profuse gonorrhoeal discharge of five months' duration. Smears showed innumerable gonococci. I ordered that none of the old forms of treatment either internal or local were to be given, and gave him half a grain of iodum intravenously every other day with the result that where the discharge used to pour out profusely 10 days ago, he can scarcely squeeze any out now. After the fourth injection there was considerable improvement in the local condition and the smear shows very few gonococci. He is still under treatment.

TUBERCLE

I hope to publish later a separate report on my experience in the treatment of tubercle with iodine.

A Mirror of Hospital Practice.

AN UNUSUAL COMPLICATION IN KALA-AZAR

By H. CHATTERJEE, M.B., late

CAPT. I.M.S.

Barisal

THE patient aged 28, Hindu male, was suffering from occasional fever, greatly enlarged spleen and liver with ascites for the last two years. He had undergone various methods of treatment available in the locality. One day he went marketing in the bazar and was suddenly seized with a violent fit of vomiting after which the patient felt acute pain in the abdomen and was helped home by friends in a semi-collapsed condition.

I was called in on the evening of the fourth day after the above occurrence, and found the patient in great distress from the pressure symptoms of the abdomen, dyspnoea, palpitation, pain and tenderness in the abdomen, scanty urine, constipation and thirst. The abdomen was very tense and tender, and no viscera could be palpated. The apex beat was found in the third interspace with diffuse cardiac impulse. The appearance of the patient was very anxious, and the pulse rapid and thready. There was a distinct fluid thrill in the abdomen but its consistency was firmer and heavier than ordinary ascitic fluid would account for,

The rapid exaggeration of abdominal tenderness, together with sudden acute pain in abdomen (commencing from the time of vomiting), anxious appearance, rapid thready pulse, thirst and collapsed condition all unmistakably pointed to hæmorrhage in the peritoneal cavity. To avert impending death from pressure symptoms, paracentesis was decided upon and was performed the following morning. As expected dark coloured blood came out and was removed to the extent of three and a half pints, when the flow had to be stopped as the patient shewed symptoms of further collapse.

Abdominal examination revealed a greatly enlarged spleen extending quite down to the lig. inguinale and symphysis pubis, and to the right touching the enlarged margin of the liver, which latter was enlarged two and a half inches below costal margin.

L D bodies were discovered after a spleen puncture, and treatment with potassium antimony tartrate was commenced from the third day after tapping the abdomen, and continued every third or fourth day, very gradually increasing the dose.

On the twelfth day after evacuation of the blood from the abdomen the latter was again uncomfortably distended and a second operation was performed, the fluid this time being sero-sanguinous and of a still darker colour.

The patient began to improve with astonishing rapidity after the third injection when the dose was increased to 2 c.c. of a two per cent solution. Nine injections were given altogether, increasing the dose up to 7 c.c. The patient appears to have completely recovered, and is now in perfect health twenty-one months after the date of the last dose of injection.

The bleeding probably occurred from one of the numerous veins in the abdomen which had undergone varicosity owing to the enlarged liver and spleen.

A NEW INSTRUMENT FOR THE TAKING UNCONTAMINATED SWABS FROM THE INTERIOR OF THE UTERUS

By NITYARANJAN GUPTA, M.B.,

Medical College, Calcutta

For the last two years and a half I have been acting as Clinical Bacteriologist to the Eden Hospital and have had on numerous occasions to examine the nature of uterine sepsis in cases of puerperal fever.

Hitherto the usual method of taking an intrauterine swab has been found to be inefficient and unsatisfactory as the swab was often contaminated, usually from the vaginal wall, by saprophytic organisms to such an extent that the causative organisms could not be isolated. Even pathogenic organisms such as *B. coli* or streptococci may be found within the vagina without causing any sepsis.

When these organisms gain entrance to the raw uterine surface and there find a suitable nidus for their growth sepsis results.

The importance of ascertaining the infective micro-organisms causing puerperal fever is essential for prognosis and proper treatment of the case.

The advantage of getting a pure culture from an infective focus is apparent.

I have devised and used for eighteen months, a method of securing uncontaminated swabs from the interior of the uterus.

The following appliance has been found very useful for this purpose —

It consists of a (i) glass tube about $\frac{1}{4}$ inch in cross section and 8 inches to 9 inches in length slightly bent at a distance of about 1 inch from one open end.

This end of the tube is closed by a piece of thin rubber (which may be made from a piece of torn rubber glove) which is stretched and fastened tight with silk thread at the bend of the tube. (ii) Swab—a piece of stout copper wire and a piece of cotton attached at one end of it. The swab is kept within the tube and the other end is closed with a piece of cotton.

The whole is readily sterilizable.

Technique.—The vagina is first douched with normal saline.

The posterior speculum is then introduced to retract the posterior vaginal wall, the anterior lip of the cervix is fixed with a sponge forceps and the cervix drawn well down and held by an assistant.

The external os is touched with Tr. Iodine. The glass tube with the swab is then introduced into the body of the uterus. When the body of the uterus is reached the tube is withdrawn about an inch, and then fixing the swab with the right hand, the jacket tube is drawn downwards with the left hand when the stretched piece of rubber gives way and retracts allowing the swab to catch the uterine discharges from the cavity.

While the tube is still within the uterus, the swab smeared with the uterine discharge is drawn out through the tube and placed in a sterilized test tube for bacteriological examination, thus avoiding the least chance of contamination from parts outside the body of the uterus.

160 samples of intrauterine swabs were taken by this method.

Fifty-four yielded streptococci and thirty-three *B. coli*, both in pure culture.

The accompanying diagrams illustrate the instrument and the method of using it.

I wish to acknowledge my indebtedness to the Professors of Midwifery and Pathology, Colonel Leicester, Major Green-Armytage and Captain Shanks for their kind assistance and for the opportunities they have granted me of testing the usefulness of this device.

A NEW INSTRUMENT FOR TAKING UNCONTAMINATED SWABS FROM THE INTERIOR OF THE UTERUS

By DR NITYARANJAN GUPTA, M B, Medical College, Calcutta

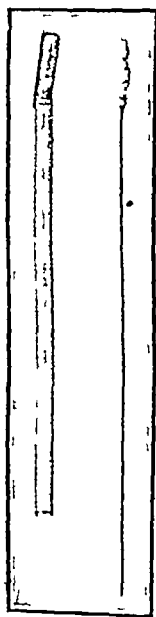


Fig I

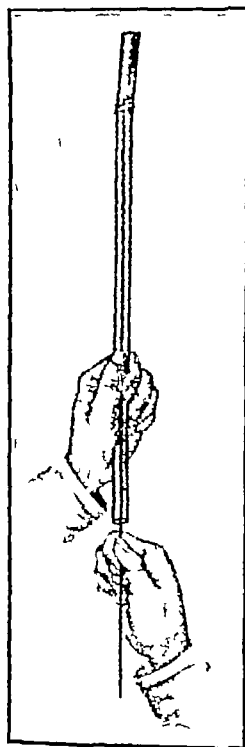


Fig II

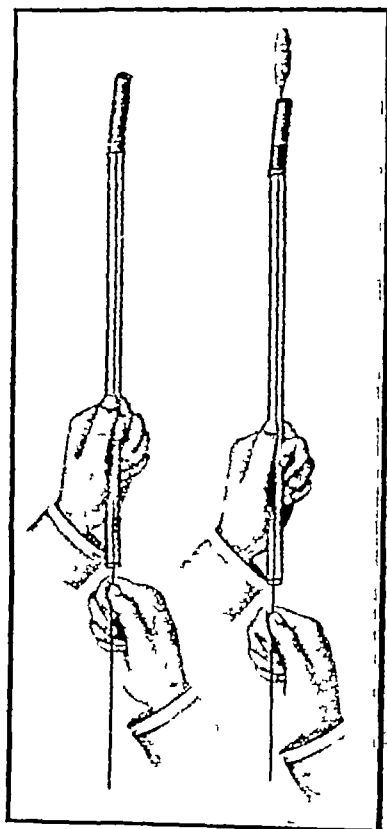


Fig III

A CASE OF ACUTE INTESTINAL OBSTRUCTION

By MAJOR F J W PORTER, D.S.O., R.A.M.C. (Retd.),
Bombay

A MAHOMMEDAN boy of about 14 years of age was brought to me on August 20th, 1922, suffering from general peritonitis, probably of appendicular origin, and practically moribund.

I opened one internal saphenous vein in front of the ankle and ran in $1\frac{1}{2}$ pint of saline-glucose and brandy and adrenalin whilst getting ready for operation.

Under local analgesia I opened above the pubes and put a large rubber tube into Douglas' pouch and another tube into the peritoneal cavity from each loin. There was a free discharge of stinking pus from the first, but only blood-stained fluid from the others. He was put into Fowler's position, given water in large quantities and the pelvic tube sucked out frequently.

After about four hours he seemed to have turned the corner and he left the nursing home in about three weeks.

On September 22nd, I found him to be suffering from pain and vomiting and advised his immediate return. On September 23rd at 9 p.m. I received a telephone message from the family doctor that the boy had complete obstruction and he was bringing him for immediate operation. I waited till midnight and then retired to bed.

Next day at noon he was brought and his condition was very bad owing to incessant vomiting. The distension appeared limited to the region of the umbilicus and was not excessive. I was just about to put him on the table when his wealthy grandfather decided that it was not worth while spending any more money on the boy and took him away.

At 3 p.m. on the 24th he was brought back by the family doctor. His condition was desperate, but not so bad as when he first came in August. I opened the other internal saphenous vein and ran in saline and glucose whilst operating. Spinal analgesia was given and the abdomen opened in the middle line. I found a coil of small intestine acutely kinked by adhesions to the abdominal wall in the region of the spleen. These were gently broken down and the coil brought outside. A small incision was then made and a loop emptied. The bowel wall was very rotten and was sutured with great difficulty. I then opened another coil, and whilst emptying it the peritoneal coat stripped of itself over a circular area about $1\frac{1}{2}$ inch in diameter. There were black patches in the wall of other coils and one came to the conclusion that the case was utterly hopeless. I cobbled the opening as well as I could, but did not think it was watertight. No attempt could be made to close the peritoneum over this raw surface. The abdomen was rapidly closed and at the parents' request the patient was taken home in the car to die.

His death on the road was confidently predicted by the family doctor. Next day at 4 p.m. I

received a telephone message asking what food could be given to the boy and saying that his condition was very good. I went at once to the house and found that he had ceased vomiting, had passed two loose stools and that his general condition was excellent.

I had him brought back to the nursing home. He never had a further bad symptom and was discharged fit and well about a month later.

This case bears out in a remarkable manner the observation made by Professor Rutherford Morison in the *Lancet* for September 9th, 1922, and which I repeat *in extenso*—

"Acquired Peritoneal Immunity"

"The older surgeons recognised that ovariectomy on a patient who had been tapped and had peritonitis, although perhaps requiring a much more difficult and tedious operation, was followed by less disturbance and smaller mortality than were simple cases without adhesions.

"They offered no explanation of this experience but acknowledged it as a curious phenomenon which seemed to be inexplicable. It is not Acquired immunity of the peritoneum is an asset of great value to the surgeon, and one that has not yet received due recognition. A first operation in the abdomen is followed by what I have called a trinity of terrors. The patient is more or less sickly for 24, thirsty for 48 and griped for 72 hours.

"After a second operation these symptoms, if they appear at all, are scarcely disturbing, and after recovery from an acute infection, the peritoneal cavity has acquired such a degree of immunity that it is scarcely possible to infect it again.

Every observant surgeon must have noted the safety of gastrectomy or colectomy done in two stages."

STAB WOUND OF ENLARGED SPLEEN

By L. W. HEFFERMAN, M.R.C.S., L.R.C.P. (Lond.),
Assistant Chief Medical Officer, Burma Corporation,
Limited, Nanttu, Surgeon to Nanttu General Hospital

A CHINAMAN, aged 35, a carpenter by trade, was stabbed in the abdomen just above, and $\frac{1}{4}$ inch to the right, of the umbilicus. The assault took place at one of the outlying stations where he was attended to by the Assistant Medical Officer, who gave him an injection of morphia and dressed the wound.

He was brought into Nanttu about midnight.

On admission—General condition good. A probe went in deeply and on withdrawal was followed by a gush of dark blood. The abdomen was tense. The patient complained of little pain and was still under the effects of morphia. A diagnosis of internal hæmorrhage was made. The breathing was rapid and the pulse quick but strong.

Operation—The abdominal skin was “dry-iodined” and an incision made over the stab wound. As soon as the peritoneal cavity was open a great gush of blood occurred and coils of small gut were forced out under pressure. This release of pressure had an immediate bad effect on the pulse. The whole operation field was covered with blood and coils of gut and it was difficult to locate the site of bleeding. The spleen was seen to be much enlarged across to the middle line, and a stab could be seen on its surface. The splenic artery was held by the fingers and thumb of the right hand whilst attempts to revive the patient were made at once. One pint of intravenous saline was given forthwith and another pint poured into the abdominal cavity. Within 6 minutes the pulse returned to its previous rate and volume. Still holding the splenic artery, the peritoneal cavity was mopped out clear of blood. Two intestinal clamps were used and the pedicle of the spleen was clamped. The splenic artery was then exposed and ligated. The whole pedicle was also separately ligated in two halves and the spleen removed.

There was a tear in the greater omentum close to the stomach and in this neighbourhood was a small hæmatoma which did not increase in size. The knife had evidently gone through here and then into the spleen. Examination of the intestines showed no injury and the abdomen was accordingly closed. A separate suprapubic puncture was made for the introduction of a drainage tube, whilst the original incision was entirely closed.

On the day after operation, the temperature was 101.2 and pulse 92, whilst the 2nd and 3rd days were normal. The temperature again went up on the 4th day. Blood examination disclosed ring form malarial parasites. Thereafter the temperature was normal and the patient made an uneventful recovery leaving hospital on the 20th day (at his own request). The wound healed by primary union.

The spleen was weighed and found to be 5½ lbs in weight.

AN UNUSUALLY LARGE SUPRACLAVICULAR LIPOMA

By DR. G. C. RAMSAY, OBE, MB, CHB (Edin),

Labac Central Hospital, Dewan, P. O., Cachar

THE successful cataract operation is the surgical magnet in a community where the standard of literacy is low.

“Seeing is believing” and the operation for cataract, like the intravenous injection of salvarsan and its derivatives for yaws and syphilis, has so converted a community formerly hostile to the syringe and the operation table that the tea garden coolie and the villager now has more faith in this

line of treatment than in our western mixtures per oram or the *dawai* of the *Kaviraj*.

The antipathy to hypodermic medication in this practice dates back to the time when Haffkine carried out his cholera investigations and inoculations.

To one surgically interested the tea gardens and the surrounding districts of Cachar offer ample opportunities, which, with a highly equipped surgical hospital at Labac are not neglected.

The distribution of some surgical complaints here is extremely interesting. Simple goitre, vesical calculus and trachoma are common diseases amongst Manipuris, yaws amongst Kukis, Lushais and Nagas, and syphilis, tubercular glands, and middle ear affections amongst tea garden coolies.



The accompanying photograph, which appears to me to be worthy of record, is that of an old tea garden coolie woman who came from a neighbouring district complaining that she could only eat her food with difficulty owing to the weight and pressure of the tumour on her neck. She gave a history of a gradually increasing painless swelling of about twelve years' duration. On examination the tacking down and dimpling of the overlying skin and the distinct lobulation when pressed upon with the flat of the hand indicated the nature of the tumour.

After dividing the skin and capsule a lipoma weighing four pounds was easily shelled out, suitable flaps were cut, the wound healed by primary union and the patient left hospital ten days after her operation.

Dr Donald Meek, my neighbouring colleague kindly assisted me with this operation, as he usually does in interesting or serious cases at the Labac Central Hospital.

Indian Medical Gazette.

JULY

KALA-AZAR IN INDIA, THE PRESENT POSITION

IN view of the collection of papers published in this issue on the subject of Indian kala-azar, it may not be out of place to attempt a review of our present knowledge with reference to the disease and its problems. There is perhaps but little that is new to record yet our current issue alone shews the attention which is being paid to this disease throughout Eastern India.

Incidence—The more carefully the question is studied the more widespread is found to be the incidence of Indian kala-azar. It is now known to be not merely imported into but to be endemic in Orissa, whilst to the west it extends as far as Lucknow. In Assam the position is one of great interest. The number of deaths recorded annually from kala-azar has risen from 1,812 in 1913 to 2,987 in 1921 and 2,292 in 1922 and the numbers under treatment from 7,188 in 1920 to 19,659 in 1922. On the face of it these figures might be taken to indicate an alarming spread of the disease in Assam, and it is true that the position in Sibsagar is one which has aroused anxiety during the past six years. Yet the true interpretation of the figures is otherwise, and they indicate rather how thorough and how vigorous are the measures now current against the disease in Assam.

The 1913 figures are an undoubted underestimate the 1922 figures, on the other hand, may be taken as reliable. The true facts of the case are that at present kala-azar has a firm hold upon at least two-thirds of the Province but that epidemiological spread and anti-kala-azar measures are alike at their maximum that the efficient work of the kala-azar survey staff, the establishment of kala-azar hospitals throughout the infected areas, and the introduction of compulsory notification, survey work, treatment and segregation has held in check an epidemic which would otherwise have almost certainly devastated the Province. Given a continuance of these measures over the next five years, and we may see a steady decline in the disease throughout the Province.

In Bengal both medical men and the lay public

have recently awakened to a knowledge of the fact that kala-azar is, if not epidemic, at least widely endemic throughout the Province and that the disease constitutes one of the principal public health problems of Bengal. If the description by Twining in 1835 of an epidemic of fever in Bengal associated with enlargement of the spleen and with cancrum oris be taken as descriptive of kala-azar, then probably the true history of kala-azar in Bengal is that the disease was introduced from over seas early in the 19th century, that it swept the Province in epidemic form, and is now widely endemic throughout Bengal, especially, as shewn by Napier, in Central, Northern and Eastern Bengal.

All our more recent knowledge of the facts in Bengal emphasises the importance of kala-azar in this Province. As shewn in an analysis of Napier's Calcutta figures given on p. 299, imported cases of the disease,—persons who have contracted kala-azar outside, but who have come into Calcutta city for treatment,—reside in almost every ward of the city. Yet, for some reason, the disease does not disseminate throughout Calcutta. There is, however, one clear and important endemic focus of the disease in Calcutta in Ward 14 and adjacent areas, and here Anglo-Indians appear to be especially susceptible.

The kala-azar research laboratory at the Calcutta School of Tropical Medicine was opened in December, 1920, under Dr. Napier. It might have been urged at that time that kala-azar was a problem of but little importance in Bengal. But, as the work of the laboratory became known, there has been a steady and constantly increasing influx of kala-azar cases from all over Bengal, some even from Orissa. To some extent one must admit that kala-azar patients are more likely than are malaria patients to come to the general outpatient clinic at the School yet peripheral blood examination, the aldehyde test and spleen puncture shew that not less than 60 per cent of all cases of fever with enlarged spleen which attend this department are cases, not of malaria, but of kala-azar.

Many of our readers will have personal recollection of the floods around Santahar in September—October, 1922. During the relief measures which were largely organised by voluntary effort among Indians themselves, large numbers of destitute children were collected at the railway

stations, and a large proportion of them were typical pictures of malarial cachexia. Yet it is reported that many of these children also shewed cancrum oris, and much of this "malarial cachexia" was and is undoubted kala-azar. The annual reports of the Director of Public Health for Bengal of recent years have dwelt upon the aftermath of the influenza epidemic, an aftermath which has shewn itself in an increased death-rate from "fevers" and a serious diminution in the natural increase of population. To what extent is kala-azar, rather than malaria, responsible for this state of affairs?

Perhaps the most striking evidence of the widespread incidence of kala-azar in Bengal, however, is the splendid work of the Bengal Anti-kala-azar League under Dr N Bhattacharji,—work which has recently received the attention of *The Statesman* and *The Englishman*, and which is worthy of all support and encouragement. Dr Bhattacharji and Dr Sen commenced a free diagnosis and treatment centre for kala-azar at Dogachia in the 24-Parganas, some 22 miles from Calcutta on January 21st, 1923. Dogachia was not selected because there was any specially known heavy incidence of kala-azar there but simply because it is within easy reach of Calcutta and because there were two medical practitioners in the neighbourhood who are interested in the subject. At this village Dr Bhattacharji, Dr Sen and their voluntary helpers twice a week carry out diagnosis by blood examination and the aldehyde test, and give free treatment. The results are literally amazing. Within two months over 500 cases were under bi-weekly treatment and by the beginning of May the number under bi-weekly treatment was 670. All proved cases of kala-azar. In all well over 3,000 patients had been seen, no less than 80 per cent of the patients who come with fever and enlarged spleens prove to be cases, not of malaria, but of kala-azar and the work at this one centre has now become so onerous that it is almost beyond the capacity of this little band of voluntary workers to handle. Also as shewn by Dr Napier on p 300 of this issue 60 per cent of these cases come from within a radius of 4 miles of the treatment centre, or from an area of only 50 square miles.

Dogachia is not in any way a selected area. If anything, owing to its nearness to Calcutta and to the facilities for treatment of kala-azar cases

in Calcutta, the number of kala-azar cases in the area should be less than elsewhere in Bengal. As Dr Napier shews, if Dogachia is a typical sample of conditions in rural Bengal, then the total number of cases of kala-azar in Bengal should not be less than 2,668,000 or at least certainly not less than one and a half million. In fact conditions in Bengal seem to indicate such widespread and heavy incidence of the disease that kala-azar rather than malaria appears to be the chief public health problem of rural Bengal.

In Madras, as shewn in the papers by Lieutenant-Colonel J Cunningham and Dr P S Vaidarajan, the disease appears to centre in Madras city itself and to be but scantily distributed, if at all, throughout the Province outside Madras city. In view of the undoubted fact that kala-azar as met with in Assam and Bengal is a disease of rural rather than of town populations, these findings are puzzling. In Madras city itself, however, we again find evidence of endemic foci in the city itself, centering around George Town, with outer foci radiating from it and corresponding to the radial spread of the population from that centre.

Symptomatology—With regard to symptomatology there is but little to add to already well known descriptions. As emphasised by Napier there appear, however, to be three chief types of onset of the disease (a) a paratyphoid-like onset,—in some cases indeed associated with a positive Widal reaction, or even with the isolation of enteric bacilli from the blood or excreta (b) a malaria-like onset, the fever being at first to some extent amenable to quinine, but later becoming resistant to quinine and associated with increasing enlargement of the spleen and liver (c) an insidious type of onset with few or no symptoms other than splenic enlargement. The question indeed as to whether there ever occurs in man a symptomless infection with *L. donovani*, similar to that not infrequently seen in experimental animals, may be one of some importance in connection with the epidemiology of the disease.

In the *Calcutta Medical Journal* for March 1923 Dr Monindra Nath De records a fatal case of hæmorrhage in kala-azar. In the same number Dr D N Banerjee and Dr J C Saha shew that there is a fall in the blood sugar content in kala-azar readings for Bengalis as low as 0.031

per cent in kala-azar being recorded as against an average content of 0.103 per cent for healthy controls. In the April number of the same journal the same authors draw attention to the outstanding symptoms of adrenal deficiency in kala-azar. There can be but little question that the endocrine system is severely affected in kala-azar; many symptoms of the disease may be associated with such deficiency, and possibly polyglandular therapy may have a new field in the treatment of this disease.

On the serological side the serological tests for the disease, both new and old, shew that there is an increase in the globulin content in the serum in kala-azar. Whether this be due merely to an increase of the normal serum globulins, as claimed by some workers, or to the production of specific globulins, as claimed by others, is not yet settled.

Treatment—In the matter of treatment there is but little advance to record. Stibanyl has not proved too successful in the hands of Indian workers, and the sheet anchor of treatment still remains the intravenous course of injections with either sodium or potassium antimony tartrate. Napier has shewn that the former salt, especially in its purified "scale" preparation, can be administered intramuscularly without excessive pain, and that such a course of intramuscular injections will cure the disease. This method of treatment, however, is still more painful and less easily tolerated than is the intravenous course. On p. 290 Major Shortt records very successful results with Dr. Brahmachari's new preparation, urea stibamine, results indeed which he claims to be more successful than those originally claimed by Dr. Brahmachari himself for the new compound.

The clinical practitioner is still faced with the difficult question of how to decide when a patient is really and truly cured, and not merely free from symptoms. We are afraid that the paper by Lieutenant-Colonel F. P. Mackie and Sub-Assistant Surgeon Hari Charan Patni will not carry him much further, though it is abundantly clear that every case of kala-azar must be considered singly and on its own merits. It is now clear that Knowles' 1920 estimate of a course of injections of 200 c.c. of a one per cent. potassium antimony tartrate as being approximately sufficient to cure the majority of cases was an under-estimate, and may apply only to cases treated in a hill

climate and under optimum conditions. Napier's present criteria, as laid down in the *Handbook of Kala-azar* published by the Oxford University Press last month and reviewed elsewhere in this issue, are—(a) as a rule 60 injections are given, (b) the patient should have been free from fever for a whole month,—in which connection it is important to note that night readings may shew fever which may be missed if the temperature be taken only during the day time, (c) spleen puncture films and cultures should be negative or—where spleen puncture is impossible—the blood picture should be that of normal health, (d) the general clinical condition of the patient should be that of a healthy person. In general if the fever subsides within two weeks of commencing treatment, treatment should be continued for two months; if within three weeks, a three months' course should be given; if fever persists under treatment for four weeks, a four months' course or more may be necessary.

Certain subsidiary factors in treatment it is essential to note. The mere course of antimony injections is not sufficient. Intestinal parasites must be cleared, and general tonics given to improve the blood condition. The endocrine deficiency may possibly indicate polyglandular therapy. There is far too great a tendency to suspend the antimony treatment unnecessarily; nephritis, cardiac debility, etc., are the outcome of the disease, and the practitioner should continue with the antimony injections carefully and cautiously. Many perhaps of the so-called "antimony-fast" cases, which fail to clear up after course of 3, 4, or even more grammes of antimony, appear to be due to hesitation in commencing the specific treatment, and to hesitation in pushing the dose in the early injections. Measures for inducing leucocytosis, such as T.C.C.O. injections, even intramuscular injections of antimony salts and possibly intravenous injection of proteins may be of value. The antimony-fast case of kala-azar is to-day one of the most difficult therapeutic problems in tropical medicine, but such cases would undoubtedly be fewer if the general practitioner hesitated less in commencing and persevering with the antimony treatment.

What the general practitioner and the patient are looking for, however, is not treatment by a prolonged and tedious course of intravenous injections, practicable only for the trained expert, but some easy and successful method of cure by

either intramuscular or hypodermic injections or by oral administration. The number of new antimony compounds which continue to be produced is legion. Here, indeed, we seem to see developing two opposed schools of thought. On the one hand certain workers emphasise the fact that *L. donovani* is an intracellular parasite, that compounds with large molecular weight may not readily diffuse into the infected cells, that, except when administered in tartrate form, antimony appears to be unsuccessful in treatment, that the more elementary the preparation the greater the likelihood of success. Others seek, along the lines of the salvarsan derivatives, to produce an antimony compound which will prove the *therapia magna sterilans* for the disease. Whichever view be right any new compound will have to have its therapeutic value proved by successful use in dozens of cases of the disease before it can replace the present treatment by the intravenous administration of antimony tartrates.

Epidemiology and Transmission—The question of the transmission of Indian kala-azar is so fully dealt with elsewhere in this issue that there is but little to add to that article. Yet there is no more tantalising unsolved medical problem of the day. The claims of Mrs. Adie and of Patton for the bed bug have not yet been substantiated. Serial section cutting of infected bugs is far more likely to lead to proof of an intracellular cycle of the parasite than is insect dissection with its inevitable trauma to such delicate structures as the mucosa of the mid gut. and Shortt, in a most careful piece of work, has failed to find such an intracellular phase in serially sectioned bugs. In fact *L. donovani* is so clearly in evolution a herpetomonad that its extra-human life cycle is likely to be of the most elementary description, and the possibility of complicated extra-human life cycles is unlikely.

The very careful work of Hoare, 1921, and of Shortt, 1923, throw considerable doubt upon the "leishmaniasis in the making" of Franchini, Fantham and Porter, and other workers. That the injection of the natural herpetomonad of the water beetle into a white mouse may produce leishmania-like forms in the latter, and even occasionally symptoms suggestive of kala-azar, does not seem to carry us much further in the problem of the transmission of human kala-azar. It seems rather that it would be better for experimental workers to start with the parasite of kala-azar

as isolated from man, and investigate its possibilities in other hosts.

Our sum total of knowledge of the epidemiological facts relating to Indian kala-azar is indeed so extensive that a careful study of them by experts would almost certainly point out the direction in which experimental enquiry should be carried out. Thus in Assam the area of Jorhat, although probably repeatedly exposed to infection and surrounded by infected areas, remains free from kala-azar. In Calcutta city, although kala-azar cases are imported into almost every ward of the city annually, yet the only endemic focus appears to lie in and around Ward 14, and to especially affect the Anglo-Indian community in that Ward. Kala-azar is a disease of riverine areas and of alluvial soils. Its westward spread has for many years apparently been checked at or near Lucknow, a fact with which there may possibly be associated the change of agriculture from rice to wheat production, and an alteration in the general aspects of the countryside. The spread of the disease,—(if we may exclude a few cases from Haflong which may all have been imported into that station),—appears to stop at altitudes of 1,500 to 2,000 feet and on a change to a laterite soil. Western India appears to be protected from the disease chiefly by the Deccan plateau. Site infection is an undoubted feature of the disease, removal of tea garden coolies from an infected set of lines to new lines 300 yards from the infected site has long been proved to be successful in stopping the spread of the disease. Among the personnel of the kala-azar staff in Assam the only members who are known to have contracted the disease are three sweepers. Kala-azar cases, although admitted into the general wards of Calcutta and other hospitals, do not apparently constitute a local focus of infectivity. The disease spreads apparently along natural lines of communication, yet its spread is very slow. An infected village only gradually acquires the infection, but when it does so, the infection becomes so virulent—in the absence of prophylactic measures—that some 60 to 80 per cent of local residents take the disease in the succeeding 5 or 7 years, and it takes some 10 years for the site to become spontaneously free from infection. Is there no way of linking up the known facts of the epidemiology of Indian kala-azar of introducing co-ordinated and properly organised enquiry in place of random and scattered work?

R. K.

THE KALA-AZAR TRANSMISSION PROBLEM

By R. KNOWLES,

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L E NAPIER, M R C S, L R C P,

and

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THE problem of how kala-azar spreads from man to man probably constitutes to-day the most important unsolved problem in tropical medicine. Two of the writers (R K. and B M D G) have now had the opportunity of experimental work upon this question both in Assam and in Bengal for some five years whilst the third (L E N) has for two and a half years been upon special duty as kala-azar research worker at the Calcutta School of Tropical Medicine. It may therefore be not out of place to summarise the experimental work carried out at this School upon this problem during the years 1921 and 1922 and to publish experimental results which, although they include but few positive findings, yet seem to the writers to raise points of interest. We have not discovered how kala-azar spreads from man to man yet we consider that this problem can only be solved by co-ordinated and co-operative work under a unified direction and along certain lines of investigation. To quote Lt-Colonel J Cunningham's apt expression, many laboratories in India are to-day continuing to "peck" at the problem. We do not consider that such a policy of non-co-operation is likely to lead to fruitful results.

In dealing with this subject we do not desire to cover historical and much discussed findings nor to re-open thread-bare controversies. Yet we consider that the problem of kala-azar transmission can only be solved if it be studied from a systematic and broad point of view.

I The Systematic Position of *Leishmania donovani*

If this be attempted then the first thing to settle is the true systematic position of the parasite of Indian kala-azar. Patton (1922) has now re-named this parasite *Herpetomonas donovani*. Whilst every worker upon the problem will agree with his suggestion that the parasite of Indian kala-azar is phylogenetically an insect herpetomonad, yet we desire to emphasise the fact that at present this parasite is only known as a parasite of man and as an (involuntary) inhabitant of the gut of the bed bug. The genus *Herpetomonas* occurs chiefly as parasites of the gut of invertebrates (chiefly insects) secondarily in the latex of certain *Euphorbiaceæ*—where the infection with *H. davi* is derived from the herpetomonads of hemiptera living upon these plants. Natural infections in vertebrate hosts have however been recorded, apart from those in

experimental animals. Thus Dutton and Todd (1903) found a herpetomonad in the blood of Gambia mice. The Sergeant Brothers (1907) an infection in a pigeon. The same authors with Lemaire and Senevet (1914) infection of a gecko. Fantham and Porter (1920) infection in a fish. And Laveran and Franchini (1921) infection in three out of seven dormice examined. A herpetomonad totally different from *Leishmania* has been described by Franchini (1913) as infecting man,—*Hemocystozoon brasiliense*. In view of the facts however that the true phylogeny of the parasite is unknown, that it has never yet been found in man in its herpetomonad form, that its mode of transmission is unknown, and that both Leishman's and Donovan's names are associated with its discovery, we are of opinion that—in spite of Lt-Colonel W F Patton's great authority—it is better to adhere to the older nomenclature and to call the parasite *Leishmania donovani*, Ross (1903).

II Is kala-azar transmitted at all?

At this point we wish to ask whether kala-azar is really transmitted from man to man or not. Wenyon (1914) has thrown out the interesting suggestion that kala-azar in man may be merely an end phase of insect herpetomoniasis—that the parasite may be a herpetomonad of some biting insect which abounds in the infected localities and its natural transmission be from insect to insect *via* a contaminative cycle and that man may occasionally be bitten and accidentally infected by this insect. In this event kala-azar would not be transmitted from man to man at all, but each individual case in man would merely constitute an end phenomenon. Such a suggestion is supported by the large volume of experimental work carried out by several workers, but especially by Fantham and Porter and by Laveran and Franchini from 1913 to 1922. These workers claim to have repeatedly succeeded in artificially infecting vertebrates with the flagellates of different insects both associated with and unassociated with vertebrates, a kala-azar-like disease having resulted, and *Leishmania*-like forms being found in the liver and spleen. This work is so well known that it need not be referred to in further detail.

Were this suggestion to hold good all the experimental work in India on kala-azar during the last twenty years would represent merely wasted effort and the reason for the difficulty experienced in solving the kala-azar transmission problem would be that such transmission does not occur. The importance of the suggestion is therefore very great. We consider however that three facts, if not others also, negative this view—

(I) No special biting insect has been recorded as especially prevalent in connection with kala-azar epidemics or in kala-azar areas

with the possible exception of *Conorhinus subroscitatus* by Awati (1922) The special household and family incidence of kala-azar suggests its transmission from man to man rather than the special prevalence of some species of biting insects in the locality

(II) The careful work by Hoare (1921) and that by Shortt (1923), also the attempts of Wenyon (1908), (1914), Chatton (1919) and Noller (1920) to produce experimental leishmaniasis in vertebrate hosts by injection of insect herpetomonads all gave completely negative results Hoare's paper is a model of careful and painstaking work, and should carry much weight He concludes as follows—"The conclusions of Fantham (1915), and the more general conclusion that leishmaniasis are 'arthropod-borne herpetomoniasis' are very interesting from the theoretical point of view, and it is quite possible that later discoveries will prove this to be a fact, and not merely a hypothesis The facts available at present, however, do not in my opinion permit one to assert that the natural herpetomonads in insects, especially in those not associated with vertebrates, may become pathogenic when introduced into the latter, as the author suggests" A study of the literature compels us to accept Hoare's conclusion as a true presentation of the case and, although *L. donovani* may be phylogenetically an insect herpetomonad, yet, as we know it to-day, it is a natural parasite of man, and not of any other proved host

(III) Knowles (1920) suggested that the successful treatment of cases by intravenous tartar emetic might act as a factor in stopping the spread of the disease It is pleasant to be able to record that this idea has now passed from the realm of hypothesis into that of fact and in a paper read before the annual meeting of the Assam Branch of the British Medical Association at Haflong in January 1923 Lt-Colonel T C McCombie Young, I.M.S., Director of Public Health, Assam, brought forward very striking evidence of the value of successful treatment of cases as a factor in stopping the spread of kala-azar In a discussion with the senior writer (R K) Colonel Young shewed the full statistics upon which his paper was based Briefly the experience of the kala-azar staff in Assam in recent years is this, that if there are only 4 or 5 cases of kala-azar in a village and they are all simultaneously placed under treatment, the disease is stamped out and disappears from the area The village has a clean bill of health for the ensuing 2 or 3 years On the other hand if there are some 10 to 20 cases and only a few of them come under treatment, the spread of the disease continues and pursues its usual rate of progress These facts are quite inconsistent with the view that Indian kala-azar is in reality an insect herpetomoni-

asis and that man is merely a secondary host of the parasite, and his infection an accidental and end phase Were kala-azar in reality insect herpetomoniasis, the successful treatment of cases should not influence the spread of the disease

We may conclude therefore that essentially *Leishmania donovani* is a parasite of a man, rather than of any insect and that kala-azar is transmissible from man to man and spreads amongst the human rather than amongst the arthropod population of infected areas

III Secondary Factors in the Production of kala-azar

During the last two years in Calcutta we have been increasingly impressed with the importance of secondary factors in inducing kala-azar As pointed out by Napier (1922), although the fever and mode of onset of kala-azar may vary very widely, yet three definite clinical types of onset may be clearly recognised—(a) commencing with an enteric-like fever, (b) resembling chronic malaria, but with increasing size of the spleen and liver, and (c) commencing as a dysentery, either of amoebic or of bacillary origin, more frequently the latter

A large percentage of the cases of kala-azar in permanent residents in Calcutta who applied for treatment at the School during May, June and July 1922, gave a definite history of having been treated for enteric fever at one of the large Calcutta hospitals during the previous December or January The fact that the Widal was usually negative in these cases suggested that the original diagnosis of enteric was mistaken, but in two such cases the *B. typhosus* had been recovered from the faeces and in a third case from the blood In others the Widal reaction which was negative at 1 in 20 dilution had been positive to 1 in 100 only three months before

On the other hand there are now several instances in the literature,—Patton (1914, p 503, case 79), Mackie (1922, p 330), Knowles (1920, pp 141-142), where infection with *L. donovani* has been practically symptomless Mackie (1922) raises the question of the possible existence of symptomless kala-azar "carriers" The present vogue, in Bengal at least, of half treating patients and stopping the antimony treatment as soon as the clinical symptoms are ameliorated is possibly turning loose throughout the Province hundreds of individuals who still harbour *L. donovani* in their tissues, but are comparatively free from symptoms A further good example of symptomless leishmaniasis is Dr Brahmachari's case of dermal leishmanoid The patient remained perfectly well and free from symptoms for about two years between the date of being cured of kala-azar and the appearance of the skin lesions yet it seems fair-

ly clear that the parasite must have been present in his tissues during this interval

In brief it may be asked whether infection with *L. donovani* is always attended with symptoms. Is it possible that the true etiology of the onset of kala-azar is infection with *L. donovani* plus some secondary factor? We suggest that attention should be paid to this point. Is it possible that symptomless herpetomoniasis of man is widespread in the endemic areas that a human carrier may carry the infection for months or years, may possibly be infective to others, yet shew no symptoms himself, and yet when his health is undermined by coincident enteric fever, severe malaria or amœbic or bacillary dysentery and the resistance of his tissues is weakened, that he may become suddenly the victim of true, and—in the untreated subject, usually fatal—kala-azar? As will be seen later “transient leishmaniasis”—an infection with *L. donovani* which can be detected only by culture of liver puncture fluid,—is not uncommon in experimental kala-azar animals. Does anything of a similar kind occur in man? Is kala-azar in man but an expression of a more widespread and usually symptomless herpetomoniasis of man in the infected areas? The point is one of importance in connection with the transmission problem, since widespread infections which only give rise to kala-azar in a small proportion of infected individuals and then only at a later date when some secondary disease factor causes the appearance of symptoms, might be simultaneous and not consecutive. We do not desire to lay any stress on this unorthodox and possibly improbable view yet the facts are there. Kala-azar appears to be too often the sequel of some other preliminary disease—enteric fever, relapsing malaria or dysentery—for this phenomenon to be the result of pure chance. We propose to study and culture the blood of near relatives and of household associates of kala-azar patients and to analyse the results found in a later communication.

To summarise these introductory sections we may conclude that the name *L. donovani* should be adhered to for the parasite of Indian kala-azar—a parasite whose only known host at present is man that kala-azar is essentially an infection of man rather than of any other host and is normally transmitted from man to man and that the question of the existence of kala-azar carriers and of possibly symptomless human herpetomoniasis in the endemic areas should receive attention.

Taking these premises as granted and assuming, as has been universally held to be the case, that the beginning of an outbreak of kala-azar in any area is the arrival in that area of an infected patient,—if any really systematic study of the problem before us is to be

undertaken, then the first question to answer is —

IV How does the Virus of kala-azar escape from the Infected Patient?

Here we have many possible alternatives

(A) *The sputum and nasal mucus*—During 1922 at the School the sputa and nasal mucus of nine untreated kala-azar patients were carefully examined (a) in fresh preparations (b) in Leishman stained films and (c) in cultures upon N N N medium. Nothing suggestive of *L. donovani* was found. Both epistaxis and bronchio-pneumonia are common complications of kala-azar yet there is no special reason to suppose that the parasite is eliminated from the patient *via* the sputum or *via* the nasal mucus.

(B) *The Urine*—The catheter urines of six untreated male cases of kala-azar were examined by the same methods. Nothing suggestive of *L. donovani* was found. As shewn by Knowles (1920) albumin and urobilinogen are commonly found in the urine of kala-azar cases yet the first is an expression of the interstitial fibrosis of the kidney which accompanies the ravages of the disease, and the second of the fine intercellular cirrhosis of the liver and its inability to deal with the decomposition products of hemoglobin. There is nothing to especially indicate elimination of the virus *via* the urogenital system.

(C) *The Skin*—The text-books appear to be unanimous in stating that *L. donovani* is found in the cutaneous lesions of kala-azar patients. Upon what basis of evidence this statement rests we have been unable to discover. Christophers (1904-1905) and other workers are stated to have seen *L. donovani* in skin lesions in kala-azar patients but we have been unable to confirm such findings. Blister fluid from three untreated kala-azar cases was examined in 1922, but no parasites seen. *Streptococci* being present in two of the three cases. The condition known as “dermal leishmanoid” will be considered later, but—despite Manson’s suggestion to the contrary—we can see no special reason to incriminate the skin as the channel of elimination of the parasite. There are no skin lesions characteristic of the disease. Bengali Hindus who are prone to contract kala-azar, are scrupulously cleaning in person and do not ordinarily suffer from *Pediculus* or *Acarus* infestation. Scabies—(as distinguished from septic folliculitis, with which it is often confused)—is relatively rare in Bengali patients. We have especially examined kala-azar patients with a view to discovering any skin lesions especially associated with the disease and with the exception of “dermal leishmanoid,”—a condition which points rather to invasion of the peripheral blood than to elimination by the cutis vera—we have been unable to discover that kala-azar patients are

particularly prone to skin lesions of any type. There is nothing, in fact, which would lead one to conclude that the parasite is usually eliminated via the skin. "Antimony rashes,"—whether due to antimony administration or not,—are not infrequently seen during the course of treatment, yet the roseola spots, when punctured, do not shew *L. donovani*. Unless any evidence of real value to the contrary be forthcoming, we cannot regard the skin as a channel of elimination of the virus.

(D) *The Faeces*—Here the problem is more complicated. The special association of endemic and epidemic kala-azar with bad conservancy or with an entire absence of any conservancy methods whatever has been emphasised by many of the Assam workers in particular. Bad conservancy or none, general filth, and overcrowding and kala-azar go hand in hand. In Calcutta the community, above all others, which appears to be especially affected by kala-azar is the poorer Anglo-Indian one. Their water supply, which is the general piped supply of the city, is unimpeachable but their kitchen and conservancy arrangements leave much to be desired. Colonel McCombie Young informs us that, of the staff of the special kala-azar hospitals on Assam, the only members who have contracted kala-azar are three sweepers. Critien (1910), Mackie (1914), and Knowles (1920) have described "cystic bodies" as occurring in the stools in kala-azar dysentery and simulating *L. donovani*.

In a recent article Marian-Perry (1922) records the finding of *L. donovani* in masses in the submucous tissue of the jejunum of an infected patient. The first illustration of his paper is rather unconvincing, whilst the second is extremely diagrammatic. It is unfortunate that this author gives no details as to the source of his material. Yet Lt-Colonel F. P. Mackie, I.M.S., who has seen the original sections, assures us that the findings are beyond question *L. donovani* and we must accept it as proved that in kala-azar the parasite is present in immense numbers in the submucous tissues of the jejunum and—presumably—in the bases of any intestinal ulcers which may occur.

In brief the evidence in favour of elimination of the parasite *via* the faeces is not inconsiderable. Accordingly during 1922 special attention was paid to this point and Table I* shews the protozoal findings in 265 stools from 210 kala-azar patients and in 456 stools from 320 patients suffering from diseases other than kala-azar. (It may be remarked, in passing, that the diagnosis of kala-azar depended in every instance upon the finding of the specific parasite in either spleen puncture films or cultures or in peripheral blood films or cultures.)

A study of Table I shews that the findings in the stools of kala-azar patients are not strikingly different from those in the stools of patients suffering from other diseases,—except in one particular. Every stool here reported upon was examined in both saline and in 1 per cent Iodine emulsion with a Zeiss 1/7th inch oil immersion objective and a Zeiss $\times 125$ binocular eyepiece,—a combination which gives high magnification, stereoscopic vision and great detail and definition, and which the senior writer (R. K.) considers unequalled for examination of fresh faecal films. In addition whenever objects were encountered of uncertain or doubtful character air dried and Leishman or hæmalum stained films of stool emulsion spread upon slides smeared with serum, and very frequently faecal films fixed with Schaudinn's fixative and stained by Haidenheimer's iron-hæmatoxylin process, were examined.

The results shewn in Table I may be taken as accurate within the ordinary limitations of routine laboratory examination. They were not pre-judged and were only put together from the laboratory records after a year's work upon the question. In only two particulars do the stools in kala-azar differ materially from those of non-kala-azar patients—

(a) In the kala-azar stool, whether formed, semi-formed, or diarrhoeic, yeasts are a most prominent feature—57 per cent as against 10 per cent in non-kala-azar stools. So constant is this finding that if the stool be found to be loaded with yeasts and the patient to come from a kala-azar area the suspicion of possible kala-azar should be aroused. In non-kala-azar yeasts have been especially found in the stools of patients suffering from sprue, diabetes, intestinal tuberculosis, and what may be termed diarrhoea in association with pancreatic deficiency, as evidenced by the abundance of oil and fat globules and soap spheres in the stools. The fact that the stool in kala-azar tends to be laden with yeasts requires some explanation. As is well known in kala-azar the appetite tends to be voracious, and the digestive faculties to be low. This may possibly account for the unusual frequency of yeasts in kala-azar stools. At present we are studying the hydrogen-ion concentration in kala-azar and non-kala-azar stools, respectively, in order to ascertain whether there is any significant difference in the pH readings.

(b) In 13 instances in the stools from kala-azar patients "cystic bodies" were encountered but in every instance in a stool loaded with yeasts. The forms seen do not shew a kinetonucleus clearly differentiated from a less deeply staining globular macronucleus and although they simulate *Leishmania* often very closely, a careful study of these "cystic bodies" convinces us that they are only yeast^c.

* The Tables, giving all the experimental data, will be found in the Appendix to this paper.

of an aberrant type. We would here draw attention to and deplore the tendency of certain workers to consider atypical and doubtful—more especially mononucleate forms—as *Leishmania*. Mononucleate forms cannot be considered to be *Leishmania* and are far more probably yeasts.

Further the finding of "doubtful bodies" in the spleens of experimental animals is not proof of *Leishmania* infection since the most marked and prominent feature of *Leishmania* parasites is the deeply staining kinetocore. Even in the "torpedo forms" found in the human spleen and described by Knowles (1920), although macro- and micro-nuclei are so closely approximated that at first sight one might mistake them for a single nucleus, yet careful focussing will always shew both nuclei. In five years of careful study of the faeces in kala-azar the senior writer has never once come across undoubted forms of *L. donovani*. It may be urged that if *L. donovani* is eliminated from the patient via the faeces it may be in some sepsis-resistant and hitherto unrecognised form yet one would surely expect in years of careful study of this question to have come across such novel forms, had they been present. The case for the elimination of the parasite via the faeces is still non-proven.

(E) *The Peripheral Blood*—During 1922, 442 blood films from 140 proved cases of kala-azar in both out-patients and in-patients were examined at the School. Nineteen per cent of cases and 12 per cent of films shewed *L. donovani*. Up to 15 parasites per large hyaline mononuclear leucocyte, and either one or two parasites per infected polymorphonuclear leucocyte were encountered. These findings are based upon an examination of only 32 films per patient on an average. Had a larger number of films been examined per patient the percentage of positive results would probably have been increased. In Bengal, just as in Assam, *L. donovani* can be found in peripheral blood films from kala-azar cases if only the blood be examined often enough and with sufficient thoroughness.

During 1921 at Shillong the junior writer (B M D G) cultured the blood of 33 consecutive kala-azar patients on N N N medium, using Row's technique. In 2 of these cases the cultures remained sterile and shewed no parasites both were patients who had received a considerable amount of antimony treatment and were clinically cured. In the other 31 cases, all untreated, the cultures were in every instance positive. The peripheral blood culture work at Calcutta in 1922 is shewn in Table II. Of 19 untreated kala-azar cases all gave positive cultures of the peripheral blood. With four other patients—suspected kala-azar—the cultures were negative. In two of them spleen puncture films and cultures were also negative so that both were

probably not kala-azar whilst the other two were also probably some other disease. Peripheral blood culture is, in fact, so reliable a method of diagnosis when properly carried out and using Row's method of leaving the blood overnight in citrate saline in the cool incubator before sowing into the N N N tubes that we may place the reliability of the tests for kala-azar in the following order—

(i) Culture of spleen puncture fluid on N N N

(ii) Culture of the peripheral blood by Row's method

(iii) Examination of spleen puncture films no cultures taken

(iv) Culture of liver puncture fluid on N N N

(v) The aldehyde reaction

(vi) Examination of liver puncture films no cultures taken

(vii) Examination of peripheral blood films no cultures taken

The evidence is now conclusive that the virus of kala-azar is always present in the peripheral blood of the untreated patient. The paucity of positive findings in peripheral blood films is simply an expression of the scantiness of the parasites.

During 1922 two cases of a new type of infection with *L. donovani* in man came to light and as these cases tend to support the contention that the virus of kala-azar is always present in the patient's peripheral blood they may be considered in some detail.

V Dermal Leishmanoid

Several workers have recorded the finding of *L. donovani* in skin lesions in kala-azar patients. Such findings however in no way correspond to the entirely new condition of "dermal leishmanoid" first described by Brahmachari at the February 1922 meeting of the Medical Section of the Asiatic Society of Bengal. A second case of the same condition was reported by Dr S P Bhattacharji, Assistant Professor of Tropical Medicine, Calcutta School of Tropical Medicine in March 1922. Dr Brahmachari's case has already been reported in full,—Brahmachari (1922-1923). We are very much indebted to Dr S P Bhattacharji for permission to give the history of his patient, which is as follows—

The patient is a Hindu male adult who first came under treatment for kala-azar some four years ago. He received 32 intravenous injections of antimony salt, and was discharged clinically cured. Two years later he contracted syphilis followed by an extensive generalised secondary eruption of so severe a character that it simulated small-pox. Novarsenobillon was given and the condition cleared up. The patient's general health now remained good for another 1½ years but by degrees

nodules, resembling those of nodular leprosy, began to appear on his ears, hands, arms, back, chest, and especially in the scrotum. Twenty further injections of potassium antimony tartrate and six of novarsenobillon were given and the skin is now clear.

Details of the laboratory work in connection with both cases are given in Table III. It will be seen that films from five nodules in connection with the two patients shewed numerous *L. donovani* and a rich growth of typical *Leishmania* flagellates was obtained from a nodule of the first patient. On the other hand peripheral blood films and cultures shewed no parasites and in the second patient in whom the spleen was still palpable and could be punctured, spleen puncture films and cultures were negative. The virus was transmitted to a *M. rhesus* monkey, using the pocket flap technique, and not only did the monkey develop localised nodules full of *L. donovani*, he also developed a third nodule by auto-inoculation at the canthus of the eye. A photograph of the infected monkey is shewn in Plate A. Films from the monkey's nodules shewed numerous *L. donovani* and N N N cultures gave a rich growth of flagellates. The disease remained localised in the monkey and did not visceralise peripheral blood films and cultures giving negative results as also did films and cultures from liver puncture of the monkey on two occasions.

Neither patient at the time of examination shewed any clinical evidence whatever of kala-azar except for the residual enlargement of the spleen in the second case. All attempts to demonstrate visceral infection by cultural methods failed whereas the nodules and skin were full of *L. donovani*. The etiology of this new disease, "dermal leishmanoid," appears to be as follows—A patient suffering from kala-azar is partially or incompletely treated. The parasites are circulating in his peripheral blood. He acquires a petechial rash from any cause. In Dr Brahmachari's case a rash possibly due to antimony, in the second patient a secondary syphilide. The parasites settle in the petechial spots of the rash and grow in the endothelial cells of the skin and subcutaneous tissues, where they are more or less sheltered and protected from antimony circulating in the peripheral blood. By degrees the patient recovers completely from his kala-azar, of which disease neither clinical nor laboratory evidence can now be obtained. But the parasites continue to multiply undisturbed and the final picture is that of a patient in good health with no evidence of visceral disease but covered from head to foot with a skin disease clinically simulating nodular leprosy, but actually due to *L. donovani*.

Both cases appear to support the contention that the virus of kala-azar is present in the peripheral blood and that this constitutes its

real channel of elimination from the infected patient.

In passing it should be noted that when *L. donovani* causes a cutaneous lesion, as with these two patients, the lesion is entirely different from that produced by *L. tropica*. The granuloma tissue is less fibrotic and more cellular. There is no tendency to skin atrophy or ulceration and much less fibrosis and thickening than in oriental sore. The second patient shewed some excoriation of the skin of the scrotum, owing to irritation of the lesions from the dhoti, but there was nowhere in either patient the slightest tendency to spontaneous ulceration of the skin. Both cases afford evidence to support the contention that *L. donovani* and *L. tropica* are two entirely different parasites.

A study of these cases and of the facts given in Section IV brings us to our first temporary conclusion in connection with the transmission of kala-azar. We do not claim that all other possible channels of elimination of the parasite have been absolutely excluded but we may take it as a working hypothesis that the virus of kala-azar normally escapes from the infected patient *via* the peripheral blood stream. And, in the absence of any considerable hæmorrhages from the skin or mucous membranes, this must mean *via* some biting and blood sucking insect. For the moment we may lay aside the question of what insect.

VI The Flagellate Phase

Once ingested by the insect concerned, *L. donovani* rapidly becomes converted into its herpetomonad form. And if the conditions of environment under which *L. donovani* passes into its flagellate form in culture media are similar to those in the biting insect, then the five conditions laid down by Rogers (1905) must be present *viz*—

- (1) A lowered temperature of between 18 and 28°C (optimum 22°C),
- (2) asepsis is essential and the environment must be sterile,
- (3) the presence of either blood or hæmoglobin as necessary,
- (4) oxygen must be present,
- and (5) a slightly acid environment is favourable to the development of the herpetomonad form.

The *L. donovani* flagellate having been produced we may next consider its reactions to different conditions and changes of environment.

(a) *Temperature*—As shewn by Knowles (1920) a small proportion of *L. donovani* flagellates will withstand freezing for 3 days. In order to test this matter further the following experiments were carried out—

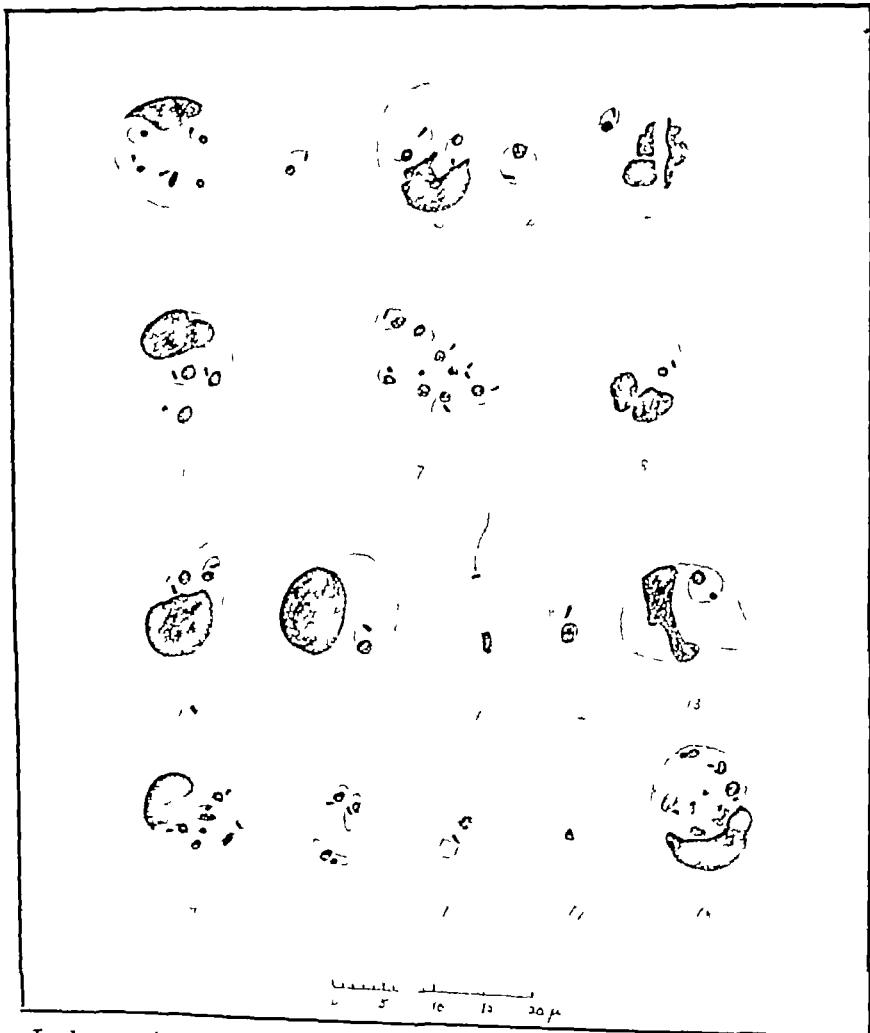
(a) Tubes of rich and very active flagellate N N N cultures were packed in ice and salt and placed in the refrigerating room at a temperature of minus 2°C. They were examined daily. At 24 hours a few were still actively motile. At 48 hours all were immobile, but many be-

PLATE C.

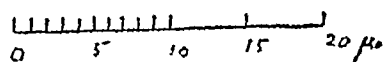
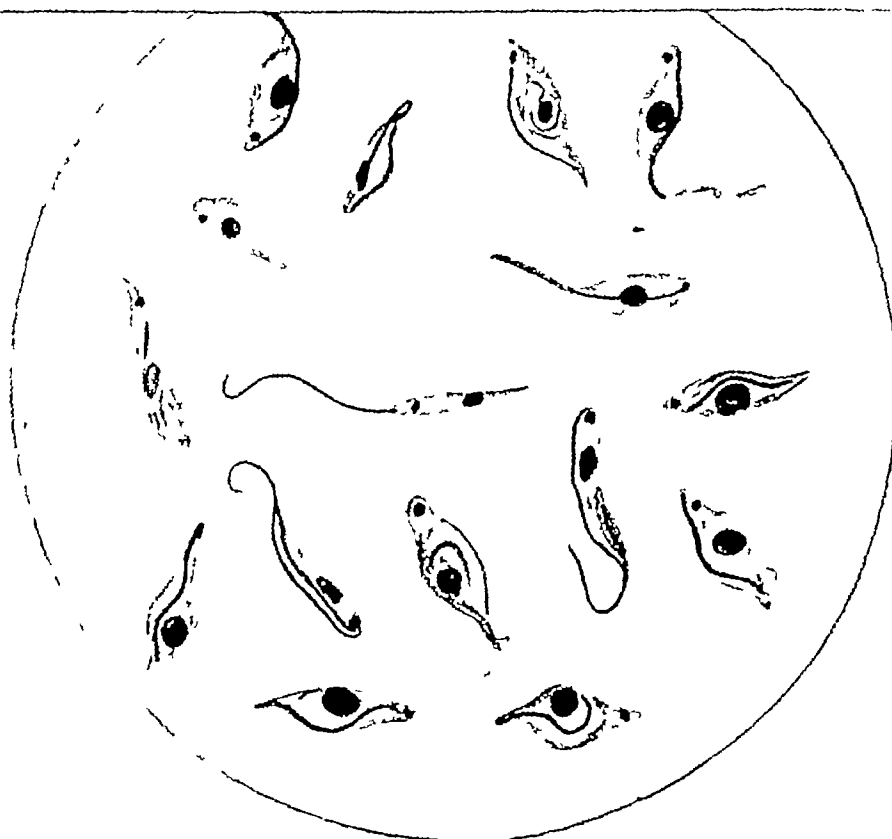


Dermal Leishmanoid Monkey Shewing the nodules on the eyebrows Both were full of *L. donovani* (The scalp is being retracted by the hand of an assistant in order to make the nodules more prominent) Reproduced by kind permission of the Editor, *Indian Journal of Medical Research*

PLATE B.

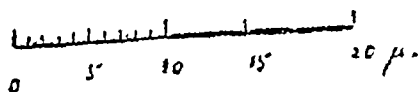
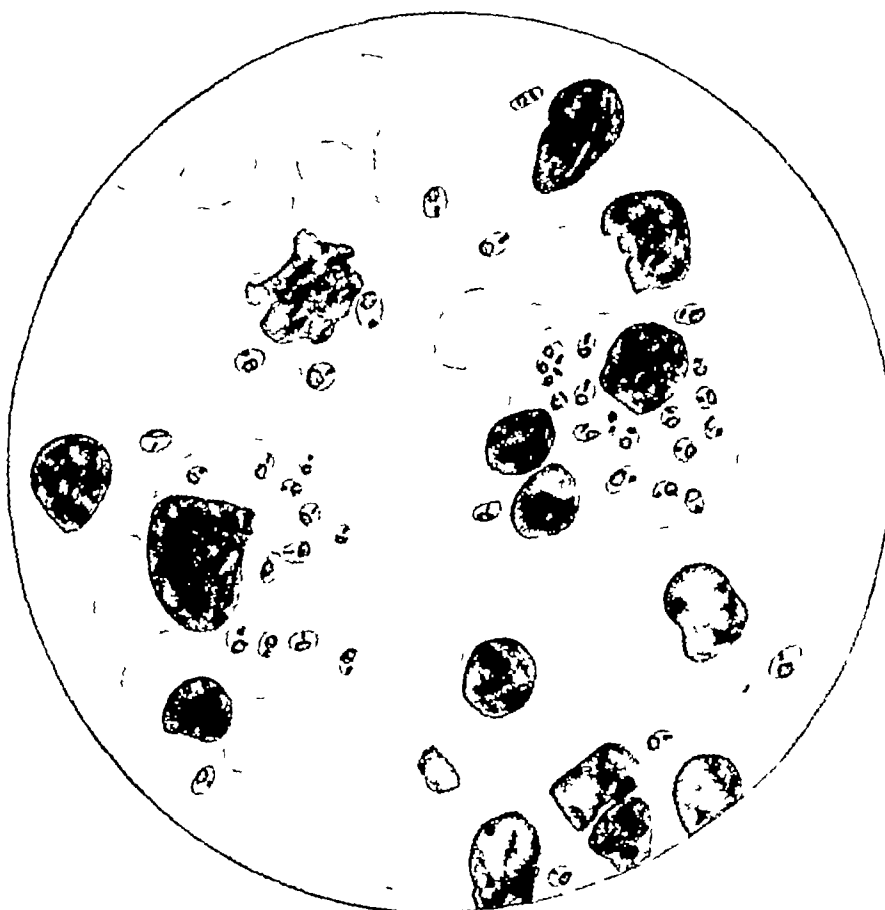


Leishman stained films from the viscera of Frog No 2 Table VI A. Figs 1 to 8 are from liver smears, figs 9 to 13 from spleen smears, figs 14 to 18 from the anterior lymph sac.



Thick-tail phases of *Herpetomonas muscae domesticae*. Schaudinn fixation, Hedenheim's iron-haematoxylin staining.

PLATE D.



A single microscope field from a spleen smear from Monkey No. 21, Table VII B. Leishman's stain.

came actively motile again after a few hours at room temperature. At 72 hours only a few regained sluggish motility when brought to room temperature. No post-flagellate forms were seen.

On the other hand once the flagellate has been formed, it will withstand body temperature successfully for some time. A set of very active flagellate N N N cultures was placed in the warm incubator at 37°C and their contents examined daily. At 24 hours the majority of the flagellates were still actively motile. A few had died. At 48 hours the cultures still showed many active flagellates. At 72 hours most of the flagellates were dead and only a few still showed active motility. At 92 hours all flagellates were dead and many disintegrated. In fresh preparations and Giemsa stained films none of these immobile flagellates showed any tendency to rounding up or to conversion into *Leishmania* forms. They simply died as flagellates. A few had lost their flagella however.

We may conclude from these experiments that, although a range of temperature of from 18 to 27°C is necessary for the production of the flagellate form, yet when once formed the flagellates will to some extent withstand exposure either to freezing or to body temperature for a short period 24 to 48 hours.

(b) *Sepsis*—As noted by Cornwall (1916) and his colleagues sepsis kills the flagellate of *L. donovani* rather by exhaustion of nutriment from the culture than by any direct toxic action upon the flagellate itself. It is the universal experience of workers on the disease that N N N cultures in the cool incubator immediately die if the medium becomes contaminated.

Yet to a certain limited extent, the flagellates will withstand a septic environment. A tube which had been 24 hours in the 37°C incubator still showed the majority of flagellates to be very actively motile. When this tube was re-examined at 48 hours it was found to be contaminated with staphylococcus albus yet many actively motile flagellates were still seen. At the third day when the tube was heavily overgrown with staphylococcus a few motile flagellates were found. On the fourth day no parasites could be detected. At no time were rounded up *Leishmania* forms seen.

To test the influence of *B. coli* on the flagellate the following experiment was carried out—

Tubes of rich and very active flagellate cultures upon N N N were inoculated with *B. coli* and incubated—(a) at 22°C and (b) at 37°C. In the cool incubator a few flagellates were still sluggishly motile at 24 hours, but no flagellates at all were seen at 48 hours. In the warm incubator no flagellates were to be found after 24 hours.

We may conclude that, although sepsis ordinarily kills the *L. donovani* flagellate yet it

does not do so immediately, even under the artificial conditions of the test tube. Under natural conditions it is possible that it may survive even longer. We are at present trying to devise experiments by which the products of bacterial growth can be continuously removed by dialysis from contaminated cultures, in order to see whether under such conditions the flagellate may not survive.

(c) *Hæmoglobin*—In order to test the behaviour of the flagellates in the absence of hæmoglobin the following experiment was carried out—

N N N medium was made up and sterile aseptic fluid added instead of rabbit blood. Tubes were inoculated from cultures full of actively motile *L. donovani* flagellates and incubated (a) at 22°C (b) at 37°C. No growth took place and it appears as if hæmoglobin is a necessary factor for the continued existence of the parasites.

(d) *Anærobiosis*—It is stated by Rogers (1905) that if an active flagellate culture be placed under anærobic conditions multiplication of the parasites at once ceases and they gradually die out. In order to test these conditions the following experiment was carried out—

Active cultures on N N N medium were placed in Buchner's tubes in the 22°C and 37°C incubators. At the end of 24 hours all were immobile at both temperatures, and at the end of 48 hours no flagellates could be found. They had all disintegrated.

(e) *Reaction of environment*—As shown in a separate paper by Napier (1923) a slight acidity of the culture medium is very favourable to the development of the flagellate form and in N N N medium acidified with $\frac{M}{10}$ HCl successful flagellate cultures may be obtained within 48 hours of inoculation of the tube with spleen juice. On the other hand on subculture back from such acid medium on to ordinary N N N the subcultures usually fail. Napier has found experimentally that successful cultures can be obtained on N N N medium at a range of pH of from 4.75 to 8.0. Above and below these limits the cultures do not take.

Now it has been shown by Megaw and others that achlorhydria is very common amongst Indian patients so common indeed that it ceases to be remarkable. Further investigation of this point is called for yet there must be many individuals, both Indian and European, in whom from time to time the pH of the gastric contents is not at its normal level of 1 to 2 but at a pH of from 5 to 6 or even greater a pH which would allow of survival of the flagellate for at least a short period of time.

We may, therefore, enquire what would be the fate of the herpetomonad form of *L. donovani* if accidentally ingested either once, or

upon repeated occasions, by an individual suffering from achlorhydria

Table IV records the results of a few preliminary experiments with reference to this possibility. It will be seen that exposure to alkalies and admixture with faecal emulsion kills the flagellates. Hence it is unlikely that the flagellates would survive long in the alkaline contents of the duodenum of a warm-blooded animal. The gastric environment however is different the bacterial content of gastric juice is not as a rule high, whilst the acidity may be temporarily reduced from many different causes. Man must become infected with kala-azar *via* either the subcutaneous or the oral route. Has the latter possibility received sufficient attention?

Table V records the results of certain experiments with active flagellate cultures on warm-blooded animals the flagellate cultures being administered (a) by injection and (b) by feeding. The feeds were given either by tying a short piece of fine rubber tubing to the nozzle of a 5 c.c. Roux syringe and passing it down the oesophagus, a method which we have found especially suitable for small animals or by laparotomy and injecting the cultures into the stomach with a hypodermic syringe fitted with a fine needle.

Few as are the experiments recorded in Table V it must be admitted that the results are completely disappointing. On ingestion by warm-blooded vertebrates the flagellates seem to be at once destroyed the infection does not appear to visceralise and cultures from the spleen and liver give negative results. Further, after hypodermic injection, the blood and serum of warm-blooded animals, unless previously de complemented, appear to at once destroy the flagellates. Pigeon No. IV, Table V (A), was selected as being a particularly small bird. 1½ c.c. of very active flagellate culture crammed with herpetomonad forms of *L. donovani* was given by a clean intravenous injection into the wing vein. No *Leishmania* could be detected in films taken immediately, or in films taken half an hour and an hour later. Cultures from the viscera and heart blood upon N N N remained negative. The injected dose of flagellates seemed to have been instantly destroyed without leaving the blood stream.

Further work upon the possible infectivity of the flagellate phase is perhaps indicated. Yet every worker upon the disease, with one exception, has recorded the difficulty of infecting experimental animals with the herpetomonad phase. With regard to Row's post- and super-post flagellates, and aflagellates and © forms, we have often seen such forms in fresh preparations and in stained films. These forms shew no cell envelope and differ entirely from the true post-flagellate, which, if it exists, should possess a definite cell membrane, as figured by Patton

(1912), in figures 67 to 73 of his Plate. It may be remarked that aflagellate forms can be produced by adding distilled water to an N N N culture and leaving it at room temperature. The flagellates lose their flagella, swell up and become rounded. Plasmolysis and chromatolysis supervene, however, and no definite cell envelope, such as a true post-flagellate form should possess, is seen.

Turning from warm-blooded animals we next studied the behaviour of very active N N N flagellate cultures in cold-blooded animals. Our objects in doing so were two-fold partly to test the hypothesis of a cold-blooded reservoir of kala-azar infection mainly, however, in the hope that in cold-blooded animals we might find animal hosts more readily susceptible to experimental infection than are warm-blooded ones. Details of these experiments are given in Table VI, A and B.

Into the anterior lymph sac of each of 19 frogs was injected from 2 to 5 c.c. of very active flagellate culture the water of condensation of from 3 to 6 rich N N N cultures being used for each injection. The fate of the injected flagellates was then studied at intervals of from 28 minutes to 14 days. In general it may be said that the results were negative. Actively motile flagellates were still found in scanty numbers at the site of injection up to 1½ hours after injection but for the most part the injected flagellates round up become aflagellate, die and are phagocytosed. The viscera (spleen, liver and heart blood) of 16 of these frogs shewed no *Leishmania* forms on most careful examination of both fresh preparations and stained films. N N N cultures from the viscera gave no growth. The usual fate of the injected flagellates is to be rapidly destroyed.

In one instance, No. 1, scanty flagellates were seen 3¼ hours after injection in a film from the spleen but the culture was negative. In another instance, No. 7, liver films taken ¾th of an hour after injection, shewed a few rounded extracellular *Leishmania* forms. Frog No. 2, however, killed 1½ hours after injection of 2 c.c. of very active flagellate culture into the anterior lymph sac, shewed unexpected findings. These are illustrated in Plate B*. At the site of injection both free *Leishmania* forms were seen figs 14, 15, 16 & 17 and also active phagocytosis, fig 18. In the liver, however, figs 1 to 8 and in the spleen, figs 9 to 13, scanty *Leishmania* forms were seen a few still flagellate, fig 11 many extracellular, figs 2, 4, 7 and 12 many intracellular figs 1, 3, 6, 8, 9, 10 and 13. As control non-inoculated frogs, the dozens of frogs used to provide material for and examined in connec-

* Plates B, C D were originally in colour but have been reproduced in black and white in publishing

Trypanosoma rotatorium has occasionally been seen, but nothing resembling the forms met with in Plate B has ever been encountered in any control frog. We are certain that the forms encountered in a study of these slides are true *L. donovani*. Further they appear to be large and rather vacuolated forms which have come from flagellates which have only recently penetrated within the cells.

Exceptionally, then, *L. donovani* flagellates, when injected into the anterior lymph sac of a frog may survive in scanty numbers up to 1½ hours after injection whilst very exceptionally they may pass into the internal viscera, enter cells, and become *Leishmania*-like in form. Yet even though visceralisation may occur as a transient and immediate sequel, the infection is soon destroyed both at the site of inoculation and in the viscera. The virus does not survive, except for a period of a few hours, in the tissues of the frog.

In the case of the *Paramus flavescens*, Table VI A, No 9, one suspicious form was encountered in the spleen films. Accordingly the spleen was emulsified and injected intraperitoneally into a white rat (Table VI A, No 12). The rat died nearly five months later. A *Trichomonas* was found in stained films from the liver and spleen. Fresh preparations were at once examined under the dark ground, and actively motile *Trichomonas* encountered. The gut, which had hitherto remained unopened, was now opened and its contents examined. A heavy intestinal infection with *Trichomonas muris* was present.

This finding raises a point of interest. One cannot say whether the penetration of the *Trichomonas* from the gut to the liver and spleen occurred before or after death of the host. Wenyon (1920) has recorded the finding of *Trichomonas hominis* deeply embedded in the mucous membrane of the gut wall in sections and several workers have suggested that occasionally *Mastigophora* parasitic in the intestine may gain access to the abdominal viscera through either an abraded or even an intact mucous membrane. If this be possible might not the herpetomonad form of *L. donovani*, if present in the stomach, possibly and occasionally gain access to the abdominal viscera?

Details of the feeding experiments with frogs are shewn in Table VI B. It will be seen that, in general, the flagellates are very rapidly destroyed in the gut, even more rapidly than are the mammalian R. B. Cs which are present with them in the water of condensation of the cultures. A few actively motile *Leishmania* flagellates may, however, survive in the gut up to 48 hours at room temperature and up to 3 days if the frog be kept at 22°C. This finding again confirms the conclusion given above that the flagellate of

L. donovani will survive for some time in the presence of a mild grade or sepsis or, at least, in the septic environment of the frog's intestine. By way of controls the frogs utilised for class purposes may again be quoted as the study of the intestinal protozoa of healthy frogs is frequently set in the practical classes. Of the natural intestinal *Mastigophora* of frogs *Trichomastix* and *Trichomonas* appear to be the most common whilst a *Bodo* and an *Octomitus* are occasionally to be encountered. No herpetomonad has ever been encountered, and the forms met with in these frogs up to the 3rd day after feeding were undoubtedly the flagellate *L. donovani* originally ingested. *Copro-monas* we have not yet encountered in the fresh intestinal contents of frogs.

To summarise our experimental findings in frogs we may state that the flagellate form of *L. donovani* when ingested by frogs may survive in scanty numbers in the gut for 2 to 3 days but the majority of ingested parasites are destroyed and there is no evidence of visceralisation. In the anterior lymph sac the majority of injected flagellates are rapidly destroyed by phagocytosis at the site of injection. Occasionally the infection may visceralise but only as a transient phenomenon. There is little evidence that the frog, at least, among cold-blooded animals is more susceptible to infection than are warm-blooded hosts.

It is, indeed, easy enough to postulate "reservoirs" of the protozoa responsible for human diseases in animals and other hosts outside man. Yet such hypotheses require the fullest confirmation before they can be accepted. Taken as a whole, the human protozoa shew a great specificity for their human hosts. Thus apart from man *Entamoeba histolytica* occurs as a parasite only in the experimentally infected kitten. The malarial parasites of man can be made to yield only transient and symptomless infections in the higher apes whilst the questions of the identity or otherwise of *T. rhodesiense* and *T. brucei* and of the identity or otherwise of *Balantidium coli* of man with the similar species found in the pig must be regarded as still unsettled.

Leishmania-donovani, as we know it to-day, is essentially a parasite of man and in its herpetomonad form at least both warm-blooded and cold-blooded animals appear to be singularly insusceptible to experimental infection. Whether man, however, is as insusceptible to infection with the herpetomonad phase of the parasite is a matter open to question.

VII The "Thick Tail" Phase

During 1922 the "thick tail" phase of *L. donovani*, originally described by Cornwall (1916), was seen in two sets of bed bugs fed upon flagellate cultures once in six bugs fed three days previously also in a second series

or bugs fed from 5 to 9 days previously (*vide* Table VIII (A) experiments of 16th and 29th June) No subsequent encysted forms were however seen. In the fresh dissections annular forms were also seen, standing out prominently as translucent, thick rings in the dissection among thick tails and normal flagellates.

Not only this, but we have twice in 1922 encountered similar thick tail forms in *Herpetomonas muscae domesticæ*. On the first occasion the fresh dissection of a very heavily infected midgut shewed at first thousands of natural herpetomonads but an hour later hundreds of thick tails were present among them. In the second instance the infection was less heavy and thick tails only appeared about 2½ to 3 hours after the dissection had been put up. Plate C figures some of the thick tails found in a Schaudinn-fixed Iron-hæmatoxylin stained film taken four hours after dissection.

The evidence all goes to shew that the "thick tail" of *L. donovani* is merely a phase of degeneration and not some part of the extra-human cycle. In the above two cases where it was met with in *H. muscae domesticæ* N N N cultures were taken. No thick tails or cysts were seen in the cultures which subsequently shewed only normal flagellates. It should be noted that none of the preparations mentioned were vased and perhaps partial desiccation may be of importance in the formation of the thick tail. The appearances seen are strongly reminiscent of the dying phases of *Trichomonas hominis* in a stale stool, so well described by Dobell and O'Connor (1921, p. 69), and mistaken by Castellani (1905) for "*Entamoeba undulans*". The only importance of the thick tail phase is that, as with pseudo-amœboid and dying *Trichomonas*, the appearances shew that the cell envelope of *L. donovani* is thin, and easily distorted or distended.

VIII Which is the infective phase of the parasite?

If *L. donovani* be a herpetomonad then its life cycle should consist of (a) pre-flagellate, —the *Leishmania* form found in man, (b) flagellate or herpetomonad and (c) post-flagellate forms. The case for a post-flagellate form, if we exclude Row's bodies, rests chiefly on Patton's historical work of 1912, and figures 67 to 73 of his Plate. The forms therein depicted may possibly be pre-flagellates which have passed through the gut unchanged yet Patton emphasises the facts that they are larger than the pre-flagellates, and that all stages from flagellate to post-flagellate were seen.

The *Leishmania* form is far more infective to experimental animals than is the flagellate form and, in this connection, we would like to draw attention to the existence of transient

leishmaniasis in experimental animals. Table VII records the results in experimental animals in 1921 and 1922 of experiments in which spleen juice or post-mortem spleen emulsion was administered (a) by injection and (b) by ingestion. Out of 77 animals injected with spleen juice only seven shewed positive results —Pups Nos 2 and 10 monkeys Nos 1, 2, 16 and 21 and white mouse No 7—all injected intraperitoneally. And in no less than 5 out of these 7 positive animals films from liver puncture, or in the case of the white mouse, from the spleen and liver on post mortem failed to shew parasites on very careful search yet yielded rich cultures of flagellates on N N N medium.

Pup No 10 shewed the virus present on culturing liver puncture fluid on the 51st day after injection. No parasites could be detected in liver puncture films or in the peripheral blood. Sub-lethal doses of the venom of *Echis carinata* were now given. It was hoped that the cytolytic action of the venom would cause desquamation into the circulation of capillary endothelial cells containing *L. donovani*, and that parasites would be found in peripheral blood films. Both attempts, however, failed. 1½ months later the infection had cleared. The pup died of pneumonia 6½ months after injection. Films and cultures from the viscera shewed no *Leishmania*.

Monkey No 16 shewed similar findings positive liver puncture cultures but negative findings in liver puncture films, on the 50th day after injection. It became very ill with what was apparently beriberi three months after injection and was chloroformed. There was no post-mortem evidence of infection, even on cultural test.

Monkey No 21 was inoculated intraperitoneally on the 27th November. On 28th December, 16th January, 1923, and 23rd February cultures from liver puncture fluid gave richly positive growths of flagellates, but no parasites could be detected in the films. Another monkey used in connection with work on epidemic dropsy died of dysentery. Examination of the fresh colon contents shewed no protozoa present other than a few *Trichomonas*. Cultures yielded an organism resembling the Flexner-Y bacilli of human dysentery. An emulsion of this isolated organism in pure culture was injected per rectum into the colon of Monkey No 21 but the animal unfortunately has never developed dysentery. It remains today in good health and free from all symptoms, although it has a symptomless *Leishmania* infection.

We have indeed found it far more difficult to induce experimental kala-azar in animals in Calcutta than have the Shillong workers. Whether this is due to differences in climate or not, we do not know. The Shillong workers appear to find it relatively easy to establish

kala-azar in experimental animals We have found it extremely difficult What we do get, when a positive result occurs, is not kala-azar but a transient symptomless *Leishmania* infection, the existence of which can only be demonstrated by culture of liver puncture fluid on N N N medium, or by the chance finding of very scanty parasites in smears from the organs

A few attempts were made to transmit the infection from an infected monkey to an uninfected one Details of these experiments are given in Table VIII It will be seen that they all gave negative results, but their negative value is considerably reduced by the fact that we have found it extremely difficult to experimentally infect animals, even when large quantities of infected material are injected into them

The few experiments with spleen juice on frogs and cold-blooded animals are shewn as items Nos 3, 10, 11 (A) and 9 (B), of Table VI The results were completely negative

IX *The Need for an Animal Strain of the Virus*

Our animal experiments in 1922 were directed especially towards one end to try and secure a "fixed kala-azar animal virus" for experimental purposes

It is difficult to over-rate the value of the human volunteer as an experimental laboratory animal The final proof that malaria is transmitted from man to man by anopheline mosquitoes was only provided by experiments on human volunteers as also was the infectivity of the blood in yellow fever In connection with the problem of kala-azar transmission, experiments on the human volunteer are most urgently called for After all, such experiment would be the crucial test, since man appears to be far more susceptible to infection than does any laboratory animal, and since the experimental infection, once acquired, could be cured by tartar emetic treatment

Take the case of a set of bed bugs or other biting insects, which have been fed upon parasite-containing peripheral blood from kala-azar patients, some of which have shewn flagellate forms of *L. donovani* and which are now believed to be at the stage infective to man How is the infectivity of such a batch of insects to be tested? Eight or nine out of every ten experimental monkeys or dogs or other laboratory animals will fail to take infection with *L. donovani*, even after massive intraperitoneal injection They will almost certainly fail to take the infection from infected insects shewing but scanty infection in their midgut And here we may comment upon the only human experiment, which so far as we are aware, has been carried out in connection with the possibility of bed bug transmission Mackie (1922) comments upon the intrepidity of Patton and Sundar Rao in allowing dozens of bed bugs,

fed upon the blood of kala-azar patients and believed to be at the infective stage, to feed upon themselves He asserts that this evidence alone is evidence strongly against bed bug transmission We consider that such a reading of the experiment completely misinterprets the case These "intrepid investigators" were so certain that *salivary* transmission does not occur in the bed bug that they allowed dozens of bugs, believed to be at the infective stage, to feed upon them, with completely negative results They did not, so far as we know, conduct what they clearly would have regarded as the crucial but dangerous experiment they did not crush such infective bugs upon abrasions on their skins, nor contaminate such abrasions with the faeces of infected bugs

It is true that Patton (1922) has shewn that the virus of kala-azar will survive in the midgut of the infected bed bug for upwards of 41 days, as tested by culture of the contents of the gut on N N N medium but, as pointed out by Wenyon (1923) the parasites of rat trypanosomiasis, and *H. muscae domesticae* will also survive for long periods of time in the midgut of the bed bug yet the bed bug has certainly no connection with the transmission of these infections

In short, how is the infectivity of any insect possibly concerned to be tested, otherwise than by experiments upon the human and susceptible volunteer?

If experiment upon the human volunteer be out of the question, at least upon any large scale, what alternative remains? In our opinion, only one to establish, if possible, a specialised and "fixed kala-azar virus" for some ordinary laboratory animal Just as Pasteur once and for all time "fixed" the rabies virus for the rabbit, so, if the kala-azar virus could once be "fixed" in maximal, exalted, virulence for a given species of laboratory animal, it would then be possible, with regard to experimental laboratory work in the first instance at least, to altogether disregard man to have at hand a standard virus with which to work an animal readily susceptible to infection, and one suitable for an experimental study of the transmission of the disease

It was to this end in particular that we directed our attention in 1921-22 Our results have, unfortunately, been almost entirely negative Yet one strongly positive result remains to be recorded

X *Can Kala-azar be acquired by Ingestion?*

As we have shewn there are grounds for believing that the virus of kala-azar leaves the infected human host via his peripheral blood *i.e.*, via some blood-sucking insect Yet does it necessarily follow that man acquires the infection via the bite of such an insect?

Table VII B shews the results in 1922 of feeding experimental animals with either

spleen juice, as obtained by spleen puncture of untreated patients or with post-mortem spleen emulsion. Of 20 such animals experimented upon, only one, Monkey No 24, *M. rhesus*, yielded a positive result. This monkey on the 22nd May, 1922, was made to chew and swallow two large pieces of spleen, full of *L. donovani*, removed from an almost untreated kala-azar patient within a few hours of death. The meal was washed down by administering 30 c.c. of a thick emulsion of the same spleen by a stomach tube. The spleen was kept overnight on ice, and next day similar feeds and 30 c.c. by the stomach tube again administered. Cultures from the spleen on both dates gave a rich growth of flagellate culture. The monkey was marked by tattooing with Indian ink over the sternum between the two nipples for purposes of identification. During the course of routine examinations this monkey was liver punctured on the 11th July and 1st August subsequently.

Both films and cultures of its liver juice gave negative results. On the 25th November, seven months after feeding, this monkey—as identified by the tattoo marks—was brought into the laboratory in a dying condition by the animal attendant. It was extremely emaciated, had acute dysentery and was obviously dying. It was at once chloroformed. The post mortem revealed an extraordinary state of affairs. In the fresh mucus from the colon no protozoa were found other than a *Trichomastix*, which had probably nothing to do with the dysentery. Leishman-stained slides of this mucus shewed nothing suggestive of *Leishmania* parasites. (Being a Saturday afternoon the media rooms, etc., were closed and cultural and other examinations as to the cause of the dysentery were impossible.) There was no subcutaneous fat, and the animal was very emaciated. The spleen was at least four times the size of the spleen of a normal *M. rhesus* of similar size, and hard and fibrotic. Films from the spleen and liver shewed *L. donovani* in immense numbers in fact in almost larger numbers than in any human infection with kala-azar. Plate D is from the splenic films of this monkey and shews the appearances in a single microscopic field. Innumerable parasites were also encountered in films from the bone marrow and heart blood, but none in films from the lungs. Cultures on N N N from the internal viscera gave a rich growth of flagellates.

In brief, this monkey died from true, fulminant, overwhelming kala-azar, very similar to the acute form of the disease as met with in man, and accompanied by a terminal and fatal dysentery. The condition was entirely different from that of "transient and symptomless leishmaniasis" recorded above. One further fact, however, remains to be recorded in giving the feeds and passing the stomach tube,

several abrasions were caused on the monkey's lips and gums and we cannot be certain whether the infection was acquired in reality via the gastric mucosa or via the abraded oral mucosa. On the other hand the extreme difficulty encountered in infecting animals via the skin by subcutaneous injections is evidence that the infection was here acquired by ingestion rather than by accidental contamination of abraded oral mucous membrane.

As the post mortem was held late on a Saturday afternoon, it was difficult to conduct further experimental passages. N N N media, which happened, luckily, to be at hand, was inoculated and gave a rich growth of flagellates. Such animals as were immediately available were collected, and the intraperitoneal passages shewn in Table VII (A) as Nos 19, 20, and 21 made. Of these the first two unfortunately died from sepsis (the media room was closed, and it was impossible to autoclave pestles and mortars). No 21 shewed a subsequent septic sinus at the site of inoculation, but subsequently recovered, and gave positive liver puncture cultures on 28th December, January 16th, 23rd February and March 31st. An oral passage was attempted, (Table VII, B, No 26), and this monkey subsequently shewed severe anæmia but both liver puncture during life and complete post-mortem examination after it was chloroformed when obviously ill failed to shew infection.

Monkey No 24 raises again the question of the possibility that kala-azar may be acquired by oral infection. Archibald (1914) has recorded experimental infection of monkeys via the oral route whilst the case of Cornwall's white rat (1916, p. 706), which shewed transient *Leishmania* infection six weeks after feeding it on spleen juice but was later still completely negative on post-mortem examination, again emphasise this possibility.

XI *The Suspects*

We have shewn that there is some *prima facie* evidence that kala-azar is transmitted from man to man via some blood-sucking, localised and domestic insect. If so, which insect, in particular is likely to be concerned?

I & II *Pediculi and Acari*—These, we believe, can be excluded. Kala-azar in Calcutta is prevalent among the very cleanly Bengalis and the Anglo-Indian community. Neither are infested with these insects to any marked degree.

III *Stegomyia*—The localised and household distribution of the disease appear to exclude a flying host with a wide range of distribution.

IV *Cimex hemiptera*—The case for this much over-rated insect has been discussed ad nauseam during the past 20 years. We have no desire to re-open the discussion with reference to it. In our opinion two further pieces

of work remain to be carried out to determine whether the bed bug does or does not transmit kala-azar. The first is serial section cutting of bugs believed to be at the infective stage. This has been undertaken by Mr C M Hutchinson, C.I.F., of Pusa, and may be safely left to his experienced hands and to his masterly protozoological technique. The second is some crucial experiment upon human volunteers who have had no possible association whatever with the disease, and this awaits the human volunteers concerned. If the bed bug transmits kala-azar this statement is surely capable of proof. Hitherto we do not consider that proof has yet been furnished.

V *Conorhinus*—If, as we are informed, the Shillong workers have succeeded in infecting *Conorhinus* with *L. donovani* and have found that the parasite passes in the midgut of *C. rubrofasciata* into its herpetomonad phase, then the case for this insect must be re-examined. A bite from an adult *Conorhinus* would be an event which could hardly pass unnoticed by a patient, and of which we can obtain no evidence on questioning patients. Yet, in its larval and nymphal stages, *Conorhinus* has all the habits and activities of a bed bug: it is a pure blood feeder, and its midgut might be suitable for the development of the *L. donovani* flagellate. *Conorhinus* is frequently met with in Calcutta and in Assam. Awati (1922) has noted that it is apparently absent from the district of Torhat in Assam, a district which presents the peculiarity of being apparently absolutely free from kala-azar, although surrounded by other and infected districts.

In Table VIII (A) and (B) will be found the details of the experimental work during 1922 on *C. hemiptera* and *C. rubrofasciata*; these experiments call for little comment, as all results were negative.

VI *Sandflies*—The work of the Sergeant brothers and their colleagues (1921) shews that oriental sore is almost certainly transmitted by *Phlebotomus* and, although the exact cycle of development in the insect and its exact mechanism of transmission remain to be worked out, the case for the sandfly in this connection may be taken as almost proved. We admit that argument from analogy is a dangerous proceeding as every barrister will agree. Yet in Africa we have two human trypanosomes very similar in morphology, yet causing sleeping sickness of two different clinical types and transmitted by two different species of *Glossina*. It is tempting to infer that in India we have two *Leishmania* parasites very similar in morphology, responsible for two different human diseases: the one transmitted by *P. papatasi*, the other possibly transmitted by some other species of *Phlebotomus*.

It will be recalled that Mackie (1915) found *P. minutus* in Assam, and found that some ten per cent of these insects were infected with a herpetomonad, but whether a natural herpetomonad of their own, or one which is identical with *L. donovani* remains open to doubt.

We have consulted Dr N Annandale, C.I.E., and Major J A Sinton V.C., I.M.S., with regard to the distribution of the Indian species of *Phlebotomus*, and are very much indebted to both, and especially to Major Sinton, for full and very detailed information on this matter. Both *P. papatasi* and *P. minutus* appear to be almost universal in India, and to occur in all Provinces. Of the sandflies of Assam but little appears to be known. One species alone, *P. argentipes*, appears to have a distribution in India somewhat similar to that of kala-azar. It is a very common sandfly of Calcutta and Bengal and has also been reported from Pusa and from Travancore but not from elsewhere in India. This, however, may be simply from our want of knowledge on the subject.

The case for the sandfly at least deserves investigation. Unfortunately the insect is one of the most difficult to work with experimentally and to rear and keep in the laboratory.

VII *Fleas*—The Mediterranean workers have always emphasised the possible rôle of fleas as vectors of kala-azar but, despite the large volume of work upon these insects, the case for them cannot be taken as proved. Fleas are rather scanty in Bengal, as compared with the Western side of India and, unless there be some special species prevalent on this side of India, as compared with Western India, there does not seem much evidence to incriminate any species of flea.

XII The Environment of kala-azar

Kala-azar in Calcutta City

The conditions under which kala-azar develops in Assam, both in tea garden coolie lines and in jungly villages, are so well known that they need not be re-described. Kala-azar, however, is, if anything, even more common in non-epidemic form in Bengal, and quite prevalent in Calcutta itself. Any solution of the transmission problem, therefore, must be one which is equally applicable to the tea garden coolie lines in Assam, to the rural villages of Assam and Bengal, and to the Anglo-Indian quarter of Calcutta City. It may therefore be not out of place to consider conditions in the latter. In order to ascertain the facts with regard to Calcutta City the case sheets of nearly 1,000 patients who had been treated for kala-azar at the Out-patient clinic at the School (L. E. N.) during the last 18 months were examined. From them cases were selected where all details of the patient's residence and movements for at least six months or more prior to acquiring the disease were

fully known and recorded. The diagnosis of kala-azar in all these 478 cases were confirmed, in almost every instance, by spleen puncture or by peripheral blood findings, and in a few only, where spleen puncture was contra-indicated, by a strongly positive aldehyde test.

These 478 cases fall into two groups—(a) Cases of kala-azar amongst temporary residents in Calcutta, *i.e.*, 238 persons who had contracted kala-azar outside Calcutta, and who had come to the city for treatment, and who had resided in Calcutta for from one week to three months before coming under observation. The distribution of these cases is shewn upon the spot map, Plate E I (b) Cases of kala-azar among permanent residents of Calcutta City, who had never resided out of Calcutta within six months or more of the onset of the first symptoms of the disease—240 cases. The distribution of these cases is shewn upon the spot map, Plate E II.

A comparison of maps E I and E II at once shews many features of interest. Wards 15, 16 and 17, which are the European wards, shew very little kala-azar, as also do wards 5 and 7, which are chiefly business and not residential areas. With these exceptions the temporarily resident cases, map E I, are fairly evenly distributed all over the city. In fact they live wherever they can secure accommodation. There is, however, a tendency for distance from the Hospital to affect the number of cases in any given ward, the largest number coming from ward 9, the ward adjacent to the one in which the Hospital and School are situated. This corresponds exactly with what might have been anticipated.

Turning to map E II, however, and to the distribution of kala-azar among permanent residents of Calcutta, matters are at once seen to be strikingly different. The effect of proximity to the Hospital largely disappears, although there is a fairly large number of cases in Wards 8 and 9. The cases from the north end of the city,—(Division I),—have dwindled from 71,—or 30 per cent of the 238 imported cases,—to 15,—or only 6 per cent of the 240 indigenous cases, and there is a very marked density of cases in ward 14 and the adjacent wards.

On maps E I and E II are marked out for comparison two special areas—area A in North Calcutta, which includes Wards 1, 2, and 3, and area B, near the centre of the city, which consists of Ward 14 and adjacent portions of Wards 13, 15, 19 and 20. The actual boundaries of area B are Dhurumtollah to the north, Free School Street to the west, Royd Street, Elliot Road, Bijli Road and Beniapara Lane to the south, and S Road, Entally and Linton Street to the east. The square area and number of population in these two areas are much the same, although both are slightly greater in area A. The number of imported

cases of kala-azar in each area is also about equal, 39 and 37 cases respectively.

Turning to the *indigenous* cases of kala-azar in Calcutta City, it is found that no less than 121, or more than half the 240 indigenous cases come from area B. Area A only shews two indigenous cases. The immediate conclusion in the face of these figures is that area B is the endemic focus of kala-azar in Calcutta, but that area A—although repeatedly exposed to fresh infection from without—remains relatively free from infection. It is necessary, however, to enquire into factors other than environment which might possibly influence these figures. The composition of the population in areas A and B differs very widely, in area A the inhabitants are mostly Hindus—including a considerable number of the more wealthy Hindus, in area B the population is a mixed one of Anglo-Indians, Indian Christians, and the poorer class of Hindus and Mahomedans.

The possible factors which have to be considered are—

(a) The proximity of the hospital to certain districts or its easy accessibility from others.

(b) The presence of other hospitals, which might withdraw the patients of any one area.

(c) The prejudice of the class of people who predominate in any area against coming to hospital.

(d) A comparatively marked tendency to attend hospital on the part of any class who have a limited distribution in the city.

(e) The marked susceptibility of any class or classes to the disease on account of their habits of life.

(f) The particular racial susceptibility of any one class.

(a), (b) and (c) can be considered together. If these factors affected the figures, map E I should not shew the evenly distributed incidence which occurs in the imported cases.

Factor (d), although an apparent corollary to (c), cannot be dismissed so easily. The Anglo-Indian community is, of all others, the one which comes to hospital most readily for treatment. They constitute about 2 per cent of the general population according to the census returns, but number 7 per cent of the general medical out-patients as shewn on the rosters at the Medical College Hospital. In Ward 14, the centre of the "heavily infected area B," Anglo-Indians form 75 per cent of the population. It might therefore be suggested that indigenous kala-azar is equally prevalent throughout Calcutta City, but that as Anglo-Indians are so numerous in Ward 14 and attend hospital so readily, this brings about the density of cases shewn in area B. The statistics for Ward 10 however dispose of this contention. In Ward 10 Anglo-Indians number 134 per cent of the population, yet

THE KALA-AZAR TRANSMISSION PROBLEM

By Major R KNOWLES, I.M.S., L. E. NAPIER M.R.C.S., L.R.C.P., and Sub Assistant Surgeon B M Das GUPTA

PLATE E



Ward 10 does not shew the peculiarly heavy incidence shewn by Ward 14. Factor (d) is therefore not of much importance in determining the concentration of cases in area B. Indian Christians are also a class who are always ready to come to hospital, but are much more widely scattered throughout the city. If the Anglo-Indian and Indian Christian cases be removed from map E II, a very marked concentration of cases is still apparent in area B.

Factors (c) and (f) may be considered together. From the figures available it is easy to calculate the percentage of cases in Ward 14 which should be Anglo-Indians if the incidence of the disease was equal in all communities in the ward. As follows—In general medical out-patients at the Medical College Indians are to Anglo-Indians as 93 : 7. But examination of the registers shews that some 50 per cent of these out-patients come from outside Calcutta City, and practically none of them are Anglo-Indians. The true proportion amongst general out-patients who are permanent residents in Calcutta City is therefore—

	Indians	Anglo Indians
General out-patients from Calcutta residents	43	7
Proportion in general Calcutta population	98	2
Proportion in population of Ward 14	92.5	7.5

If the kala-azar incidence fell equally on the two communities in Ward 14, the proportion of cases attending the Hospital should be Indians : Anglo-Indians as $\frac{92.5}{98} \times 43$, or $\frac{7.5}{2} \times 7$, or as 42.76 : 26.25, or as 67 per cent to 33 per cent, and, even after making all allowances for the large number of Anglo-Indians in Ward 14, this latter figure is still considerably below the actually recorded figure of 52 per cent. The figures for the whole of Calcutta (Napier 1922), demonstrate the same thing. Anglo-Indians constitute 13.7 per cent of all kala-azar cases seen as against only 7 per cent of general medical out-patients at the Medical College Hospital, and 25 per cent of the indigenous kala-azar cases as against an estimated 14 per cent of general medical out-patients who are permanent residents of Calcutta. Clearly there is an increased tendency among the Anglo-Indian community to contract the disease.

If so, then why? Here is a fact whose close investigation may throw some light upon the transmission of the disease. Is this predominance among Anglo-Indians due to (a) racial susceptibility, or (b) to their habits of life? If (a) racial susceptibility were the cause one would expect to find that susceptibility even more marked among Europeans. This is not the case, the disease is extremely rare amongst Europeans in Calcutta. On the other hand it shews a relative predominance also among the Indian Christians, whose habits

of life are very similar to those of the poorer class of Anglo-Indians, (b) we do not propose to discuss until further information has been acquired, but in general it is interesting to note that area B and Ward 14—especially the heavily infected area just east of the Wellesley Street tank—correspond far more to rural conditions than do area A and northern Calcutta. In area A there has been much re-building, the streets are very narrow, the population is congested and overcrowding general. There are few open spaces. In area B there has been little re-building, there are several open spaces, the prevailing type of house is the old fashioned but rather ruined stone house with large rooms and deep verandahs. Vegetation abounds. The affected Anglo-Indian population consists largely of families who have come down in the world, who find it hard to make ends meet, but who stick to quantities of family furniture with which their rooms are lumbered. Also the rooms in area B are probably darker and the atmospheric humidity higher than in area A.

Maps E I and E II appear to us to present evidence against the bed bug theory of transmission. The houses in northern Calcutta are infested with bed bugs, the infectious material, as shewn in map E I, is constantly being imported into the area, yet there is an almost complete absence of the disease among the permanent residents. It has been suggested that the invasion of Calcutta by the large numbers of patients who come to the city for treatment might lead to a serious extension of the disease among the residents. These two maps seem to us to demonstrate very forcibly that this has not yet occurred.

Conclusions—From a study of maps E I and E II we may conclude—(1) That the conditions requisite for the transmission of kala-azar from one patient to another are to be found at their best (or worst), as far as Calcutta City is concerned, in area B—i.e., Ward 14 and parts of the surrounding wards, that these conditions exist to a less extent in wards 4, 6, 8, 9, 10 and 11 but that they are almost totally absent from area A, i.e. Wards 1, 2, and 3. (2) Also that there is a slight but quite definite relative preponderance of the disease in Calcutta residents among the poorer Anglo-Indian and Indian Christian communities. If we can but secure the co-operation of the entomologists, which we so badly need, we now propose to carry out an entomological survey of area B—utilising area A as control, and to commence general investigations into the living conditions of the populations of the two districts.

XIII Summary and Review

(1) We consider that the systematic position of the parasite of Indian kala-azar is so peculiar that it should be retained in the genus

Leishmania, Ross (1903), rather than in the genus *Herpetomonas*

(2) *L. donovani* is primarily a parasite of man and is carried from man to man. There is considerable evidence to negative the view that *L. donovani* is primarily a herpetomonad of some insect, and that the infection of man is merely accidental—a hypothesis which would mean that kala-azar is not transmitted from man to man at all.

(3) Secondary factors, such as enteric fever, relapsing malaria and dysentery appear to play some part in determining the onset of kala-azar in some cases and the question is raised as to whether symptomless infection of man with *L. donovani* may not exist, and whether it may not indeed be widespread in the endemic areas.

(4) We believe that the bulk of the evidence available points to the elimination of the parasite from the infected person via his peripheral blood stream, i.e., via some blood-sucking insect.

(5) This conclusion is emphasised by the laboratory findings in connection with the new form of infection with *L. donovani* first described by Brahmachari as "dermal leishmanoid."

(6) Although *L. donovani* will only pass into its herpetomonad form under certain well-defined environmental conditions, yet when once formed, the herpetomonad form is somewhat resistant. It will, to some extent, withstand body temperature, a mild grade of sepsis, anærobiosis and a wide pH range of from 4.5 to 9.0. Conditions in the stomach of an individual with achlorhydria—a finding which is very common in Indians—might be such that the flagellate could survive for some hours.

(7) Warm-blooded animals being very difficult to infect experimentally with *L. donovani* flagellate cultures, the behaviour of the flagellates in cold-blooded animals, chiefly frogs, was studied. It was hoped that we might here find a type of animal readily susceptible to *Leishmania* infection. Despite some evidence of transient visceralisation after injection into the anterior lymph sac, our findings shew that the flagellates are rapidly destroyed when introduced into such animals, either by injection or by ingestion.

(8) The thick tail phase may occur with herpetomonads other than *L. donovani*, and is, we believe, a phase of degeneration of the flagellate, rather than any phase in the true life cycle.

(9) On injection of animals with kala-azar spleen emulsion there sets in not infrequently a transient and symptomless leishmaniasis. It can only be detected by culture of liver puncture fluid on N N N medium.

(10) As matters at present stand there is no crucial test which can be applied to ascer-

tain whether or not any batch of fed insects is really infective. Positive cultures on N N N from the gut of such insects prove that the virus is still living in their gut, but this does not constitute proof of their infectivity to man. In the absence of human volunteers, who would constitute the most suitable experimental animals for such a test, it is desirable to try to establish a "kala-azar fixed virus" in some species of animal.

(11) Our attempts to do so have hitherto met with no success. In one instance however a *M. rhesus* appears to have contracted an overwhelming and fatal kala-azar infection by ingestion of spleen emulsion. Although we believe the peripheral blood to be the channel of elimination of the parasite, yet the possibility of infection by ingestion deserves consideration.

(12) The case for *Conorhinus* and for *Phlebotomus* as possible vectors deserves further study.

(13) Kala-azar being very widespread in Bengal, and very prevalent in Calcutta City, especially among the Anglo-Indian community and in Ward 14 and "Area B," any solution of the transmission problem must be one which will fit in with the conditions met with in the tea garden coolie lines in Assam, the rural villages of the endemic areas in Assam and Bengal, and in Calcutta City alike.

Generally speaking, those with most experience of kala-azar are in favour of one of two theories of transmission. One group of workers insist that kala-azar is spread by some blood-sucking insect. The Assam medical men however emphasise its close association with bad conservancy or with no conservancy at all, and are in favour of infection by ingestion. Is there any theory which will unite both points of view? Is it possible that the parasite of kala-azar is picked up from the peripheral blood of infected persons by some blood-sucking insect whose gut happens, at the moment, to be sterile—that in its midgut *L. donovani* flagellates—and that the dead—or more probably the living—body of this insect now comes to contaminate water or food supplies—is ingested by an individual whose stomach is in a condition of achlorhydria—that, upon digestion of the insect, *L. donovani* flagellates are set free and survive for a sufficiently long period to enter the lymph stream and so disseminate into the viscera? We do not desire in any way to lay emphasis on such a speculation, but it is one which might unite the opposing schools of thought. Further, kala-azar may be acquired perhaps, rather by repeated exposure to infection, than by a single inoculation or feed.

It is deplorable that the financial circumstances of India to-day render it impossible to set on foot a well organised kala-azar commission under unified direction. For almost

twenty years different laboratories in India have "pecked" at the problem. A continuance of such a policy is likely to lead nowhere. The co-ordinated services of the entomologist, the protozoologist, the clinician and the statistician are called for. Three main lines of enquiry appear to be called for: in the field a close and continuous study of the biting insects associated with infected and non-infected areas and houses respectively in the laboratory a study of the environmental conditions under which the flagellate form of *L. donovani* passes, if at all, into its post-flagellate *Leishmania* phase and the attempt to establish a "kala-azar fixed virus," an animal strain which will render one independent of random and casual human clinical material, and provide material for an intensive study of the problem.

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APPENDIX

Tables of Experimental Data

TABLE I

General Analysis of Protozoal Findings in 721 stools from 530 patients in hospital, 1921

Kala-azar cases = 210 patients 265 stools Non-Kala-azar cases = 320 patients 456 stools

	KALA-AZAR CASES		NON KALA AZAR CASES		COMBINED TOTAL	
	Number	Percentage	Number	Percentage	Number	Percentage
<i>Character of stool —</i>						
Formed	42		76		118	
Semi formed	102		143		245	
Semi fluid	25		41		66	
Fluid	63		117		180	
Dysenteric	18		70		88	
Not recorded	15		9		24	
<i>Protozoal Findings —</i>						
E coli vegetative	10		22		32	
encysted	21		32		53	
E histolytica vegetative	8		51*		59	
encysted	17		33		53	
E nana vegetative	26		43		69	
encysted	14		22		36	
I butschli vegetative	3		2		5	
encysted	3		9		12	
Giardia vegetative	3		7		10	
encysted	25		34		59	
Trichomonas vegetative	18		24		42	
Chilomastix vegetative	18		25		43	
encysted	5		6		11	
Enteromonas vegetative	2		6		8	
encysted	0		1		1	
Cercomonas	0		4		4	
Prowazekia	0		1		1	
Embadomonas (?)	1		1		2	
Isospora hominis	1		1		2	
<i>Other Findings of interest —</i>						
No protozoa found	140	52.9%	251	55.0%	391	54.2%
Numerous yeasts	152	57.3%	46	10.1%	198	27.5%
Blastocystis	70	26.4%	105	23.0%	175	24.3%
"Cystic bodies" (<i>vide text</i>)	13		0		13	
Charcot Leyden crystals	11		46*		57	
Spirochaetes	20		22		42	

* NOTE.—A number of admitted cases of amœbic dysentery is responsible for these high figures

TABLE II

PERIPHERAL BLOOD EXAMINATIONS I KALA-AZAR 1922
 Patients examined, 140 Positive, 27, or 19.3 per cent.
 Films examined, 442 Positive 54, or 12.2 per cent.

ANALYSIS OF PARASITE FINDINGS

1 in polymorphonuclear occurred 39 times	39 parasites
2 " " " " 8 " "	16 " "
1 in hyaline occurred 13 times	13 " "
2 " " " " once	2 " "
5 " " " " "	5 " "
8 " " " " "	8 " "
15 " " " " "	15 " "
1 parasite occurred free	1 " "
Cluster of 3 parasites free occurred once	3 " "

Total 102 parasites

102 parasites in 442 films or an average of one parasite per 4.3 films

PERIPHERAL BLOOD CULTURES IN KALA-AZAR, 1922

Peripheral blood of 23 untreated case cultured 19 were positive (of whom one failed to show parasites in spleen puncture films, and two gave negative aldehyde tests) 4 were negative, all only clinically like kala-azar (two of these were also spleen punctured with negative results in both spleen films and cultures)

Peripheral blood of 7 partially treated cases cultured 6 were negative (of whom three still gave positive spleen puncture films and one negative spleen puncture films, but positive spleen puncture cultures) 1 was positive

Peripheral blood of 11 fully treated cases (receiving 2 gms or more of antimony salt) cultured, 10 were negative, and 1 still positive. [The positive case was a resistant one (E. G.) who still gave positive spleen puncture films]

Total number of cases cultured, 41

TABLE III

Kala-azar Work 1922 Experiments on two Dermal Leishmanoid Cases

(A) Dr Brahmachari's Case.

Date	Experiments	Results
9th February	Films from old lesion	Full of <i>L. donovani</i> .
	Films from new nodule	Numerous <i>L. donovani</i>
	N N N cultures from nodule	Rich growth of <i>L. D. flagellata</i> , 12th day
	Four peripheral blood films searched	No parasites seen
2nd March	Films from nodule	Scanty <i>L. donovani</i> found
	Rabbit inoculated on scarified cornea.	Failed to take
	N N N culture from nodule.	Rich flagellate growth 10th day
	Cultures of peripheral blood	Remained negative and sterile
	Cultures of blood coming from cut nodule	Rich flagellate growth 11th day
	Four peripheral blood films.	No parasites seen

(B) Dr Bhattachary's Case

Date	Experiments	Results
28th February	Films from ear nodule	Numerous <i>L. donovani</i>
	Six films of peripheral blood	No parasites seen
1st March	Films from ear nodule	Numerous <i>L. donovani</i>
	N N N cultures from nodule	Rich growth of flagellates, 11th day
	Rabbit inoculated on scarified cornea.	Failed to take Opacity only No <i>L. donovani</i> found
	Male <i>M. rhesus</i> inoculated by flap method into both eye brows	Both took together with a third auto inoculated nodule near the canthus incubation period 18 days. (vide below)
9th March	Films from an ear nodule.	No parasites seen
11th May	Films from chest nodule	Numerous <i>L. donovani</i> seen
	Patient spleen punctured	No parasites seen in films, N N N cultures remained negative
	Culture from nodule	Went septic.

(C) Further Experiments with the above "Dermal Leishmanoid" monkey

1st March	Monkey inoculated	One nodule in each eyebrow, with third auto-inoculated nodule at canthus 18th day
22nd April	Films from both eye brow nodule	Numerous <i>L. donovani</i> in both
	N N N culture from nodules.	Rich growth of flagellates on 13th day
	Liver punctured	Films and cultures negative
5th May	Monkey's peripheral blood	Films and cultures negative
	Liver punctured	Films and cultures negative
	Films from eyebrow nodules	Now fail to show leishmania
	Emulsion from nodule made and given intra peritoneally to adult female <i>M. rhesus</i>	Liver puncture, films and cultures from passage monkey showed no <i>L. donovani</i> , 20th June, 11th July 1st August and 28th December
23rd June	Collection of starved bed bugs fed on nodules.	No development, nothing found on dissection.
24th June		Monkey escaped and was last seen going over the roofs of northern Calcutta.

TABLE IV

L D Flagellates Experiments in vitro

Date	Experiments	Results.
3rd May 1922	Very active flagellate L D culture mixed with thin faecal emulsion Two tubes left overnight — (a) at 22°C (b) at 37°C	Next day—All dead Stained films shew dead flagellates, chromolysis, plasmolysis Also? scanty rounded forms still sluggishly motile
9th June 1922	Very active flagellate L D +++ culture taken and mixed — (a) Culture + aa 0.3% Pepsin one hour at 22°C = (b) + aa 0.2% HCl One hour at 22°C = (c) + aa 0.2% HCl. One hour at 37°C = (d) + aa 0.3% Pepsin one hour at 37°C =	Flagellates still active. Flagellates still active some rounding up, marked clumping—rosettes Flagellates still active majority however are rounding up, aflagellate, and Leishmania-like in type Still actively motile
10th June 1922	Very active flagellate L D +++ culture taken and mixed — aa — (a) + citrated frog's blood One hour at 22°C =	Still actively motile.

Date	Experiments	Results
	(b) + citrated rabbit blood One hour at 22°C = (c) + citrated human blood. One hour at 22°C = (d) + citrated frog's blood One hour at 37°C = (e) + citrated rabbit blood One hour at 37°C = (f) + citrated human blood One hour at 37°C =	Still actively motile Still actively motile Dead, immobile No rounded forms Ditto Completely altered flagellates No motility Rounded Leishmania forms.
14th June 1922	Very active flagellate L D +++ culture taken and mixed — (a) + aa 0.5% Na ₂ CO ₃ —an hour at 22°C = (b) + aa 0.5% Na ₂ CO ₃ —an hour at 37°C =	Flagellates collected in dead, immobile clusters Here and there a few still sluggishly motile.
19th June 1922	Actively motile flagellate L D ++ culture desiccated for 3 days over quicklime in freezing chamber at minus 2°C	Dead and rounded up flagellates seen.

TABLE V
L D Flagellates Animals 1922
A Injections only

Serial No	Date	Experiments	Date	Results
1	17th June	Pigeon Contents of three +++ cultures I V		Blood films $\frac{1}{2}$ an hour later = No L. D seen. Halteridium +
2	26th June	White mouse Hypodermically +++ culture.	Died 27th June	Films = bacteria No L. D. seen Cultures not taken
3	29th June	White mouse Three +++ cultures hypodermically	Killed 1 $\frac{1}{2}$ hours	Films from site of injection and viscera = bacteria + No L. D seen ante mortem septicæmia No cultures
4	6th June	Pigeon 1 $\frac{1}{2}$ c.c. of +++ culture I V.	2 films at once = 2 films at $\frac{1}{2}$ hour = killed 1 hour.	No L. D seen No L. D seen Visceral and heart blood films and cultures negative
5	12th June	Whitey grey mouse Hypodermically $\frac{1}{2}$ c.c. of +++ 13 days old culture with many rounded forms of Row	Killed 16th Nov	Films and cultures negative
6	14th June	White mouse Hypodermically +++ culture 15 days old with many Row's forms	Died 1st Jan 23	Films negative Bacteria only Cultures not taken

L D Flagellates Animals 1922
B Feeds only

1	9th June	White rat. Fed on 2 +++ cultures by cap pipette	Killed at 3 $\frac{1}{2}$ hours.	Stomach = few rounded blastocystis like forms Small intestine = R B Cs + No L D found
2	9th June	White rat. Fed on 2 +++ cultures.	Not traceable 16 Jan 23	
3	13th June	White rat Fed on 5 +++ cultures	Killed at one hour	Stomach = R. B Cs yeasts No L. D seen Small intestine = R B Cs Rounded blastocystis like forms
4	6th June	White mouse Fed on +++ culture	Killed at $\frac{1}{2}$ hour	Stomach contents—R. B Cs + No L. D seen Visceral films = nil
5	9th June	Starved white rat for 2 days, 1 c.c. of +++ culture injected into stomach by laparotomy, under ether anaesthesia	Killed 2 $\frac{1}{2}$ hours	Stomach contents and visceral films = negative
6	13th June	Starved white rat. 1 c.c. of +++ culture injected into stomach by laparotomy	Killed at one hour	Films of stomach and duodenal contents and viscera = nil. Cultures of viscera = negative
7	14th June	Starved white mouse 2 c.c. of +++ culture injected into stomach by laparotomy	Killed at $\frac{1}{2}$ hour.	Films of stomach and duodenal contents and of viscera = nil. Cultures of viscera = negative

TABLE VI.

Kala azar Cold-Blooded Animal Experiments, 1922

A Injections

Serial No	Date	Experiments	Date	Results
1	26th May	3 c.c. of +++ flagellate culture into anterior lymph sac of a frog	Killed 3½ hours	Films site of injections, heart blood, liver = nil Films of spleen = scanty flagellates + Cultures of all = negative
2	25th May	2 c.c. of +++ flagellate culture into anterior lymph sac of a frog	Killed 1½ hours	Motile L D flagellates at site of injection free flagellate and intracellular L D forms in liver and spleen films Cultures not taken
3	2nd June	Big frog 2 cc of spleen puncture fluid L D +++ into anterior lymph sac.	Pithed 9th June	Films and cultures of viscera = no L D (Hæmogregarine present)
4	5th June	Small frog 2 c.c. of +++ flagellate culture into anterior lymph sac	Died 6th June	Films of local site and viscera = no L D found
5	12th June	Frog +-+ culture into anterior lymph sac.	Killed 2nd day	Films of viscera = no L D seen
6	19th June	Frog 3 c.c. of +-+ culture into anterior lymph sac	Died 20th June	Films of viscera = no L D seen
7	20th June	Frog 1½ c.c. of +++ culture into anterior lymph sac	Killed ½s of an hour	Injection site = motile L D flagellates + few rounded Leishmania forms Films of spleen and bone marrow = nil. Liver films = scanty extracellular leishmania forms Viscera films = no L D found
8	24th June	Frog 2 c.c. of +-+ culture into anterior lymph sac (Frog then kept at 22°C)	Killed 3rd day	
9	7th August	Varmus flavescens 5 c.c. of +-+ culture I P	Killed 22nd August	Viscera films negative (One suspicious form in spleen films) * Vide below
10	28th October	Frog 5 c.c. of p m k-a spleen emulsion I P	Killed 11th November	Viscera films and cultures negative (Hæmogregarine present)
11	28th November	Turtle 5 c.c. of p m k-a spleen emuls on subcutaneously	Died 4th December,	Viscera films negative (Trypanosome present)
12	22nd August*	White rat injected intraperitoneally with triturated spleen of above Varmus of 7th August	Died 16th January, 1923	No Leishmania found films and cultures Trichomonas muris found in gut, spleen and liver
13	15th February, 1923	Big frog 5 c.c. of very active L D flagellate culture anterior lymph sac.	Pithed 40 mins	Few motile L D at site of injection
14		Frog 2 c.c. of very active L D flagellate culture anterior lymph sac	Pithed 1½ hours	Viscera films = nil No L D seen site of injection and films of viscera
15		Frog 2 c.c. of very active L D flagellate culture anterior lymph sac	Pithed. 30 mins	Numerous flagellate L D at site of injection many active many rounded up Viscera no L D seen
16		Frog 2 c.c. of very active L D flagellate culture anterior lymph sac.	Pithed. 28½ hours	(Hæmogregarine +) No L D seen site of injection and viscera.
17	17th February	Frog 5 c.c. of very active L D flagellate culture anterior lymph sac.	Pithed. 90 mins	No L D seen site of injection and viscera
18		Frog 5 c.c. of very active L D flagellate culture anterior lymph sac.	Pithed 2 hours	No L D seen site of injection and viscera
19		Frog 5 c.c. of very active L D flagellate culture anterior lymph sac.	Pithed. 2½ hours	No L D seen site of injection and viscera
20	22nd February	(4 very active flagellate cultures used) Frog 3½ c.c. of very active L D flagellate culture anterior lymph sac.	Pithed 2 hours	No L D seen site of injection and viscera Doubtful? Leishmania (intracellular) forms seen in spleen films
21		Frog 3½ c.c. of very active L D flagellate culture anterior lymph sac.	Pithed 2½ hours	No L D seen site of injection and viscera Scanty L D flagellates at site of injection a few still motile Viscera nil

TABLE VI
Kala-azar Cold-Blooded Animal Experiments, 1922
 B Feeds

Serial No	Date	Experiments	Date	Results
1	31st May	Frog orally 4 c c of + + + + culture	Killed $\frac{1}{2}$ hrs of an hour	Stomach=mammalian R B Cs + motile L D Sections of gut wall=? flagellates Films of viscera=negative
2	5th June	Frog orally + + + culture given	Killed 24 hours	Stomach contents = mammalian R B Cs + actively motile flagellate L D Films of viscera=negative
3	17th June	Frog orally + + + culture given	Killed 48 hours	Stomach=scanty motile L D flagellates + Films of viscera=negative
4	21st June	Frog + + + culture injected into stomach by laparotomy	Killed 1 $\frac{1}{2}$ hours	Stomach=mammalian R B Cs + scanty motile L D flagellates (Hæmorrhage also into stomach at injection site)
	3rd July	Four frogs fed on + + + culture		
5		(a) Kept at room temperature	Killed at 2 hours	Stomach=actively motile L D flagellates +
6		(b) Kept at 22°C	Killed at 24 hours	Stomach=actively motile L D flagellates +
7		(c) Kept at 22°C	Killed on 3rd day	Stomach=few motile L D flagellates +
8		(d) Kept at 22°C	Killed on 3rd day	Stomach=few motile L D flagellates + Films of viscera from all four negative
9	28th Oct	Frog 3 c c thick emulsion of p m k-a spleen L D + given orally	Killed 4th Nov.	Films and cultures of viscera negative
10	12th Feb 1923	Big frog 2 $\frac{1}{2}$ c c very active L D flagellate culture stomach tube	Pithed 85 mins	Stomach=no L D Seen Octomitus + Lower gut=scanty L D flagellates + several still very active many dead Active flagellate (? Leishmania) seen in fresh spleen and liver preparations none in stained smears
11		Big frog 3 c c of very active L D flagellate culture by stomach tube	Pithed 95 mins	No L D seen in stomach or gut Trichomonas, Trichomastix, Opalina and Entamoeba seen Viscera no L D seen
12		Big frog 3 $\frac{1}{2}$ c c of very active L D flagellate culture by stomach tube	Pithed 135 mins	No L D seen in stomach, gut or viscera fresh preparations and films
13		Big frog 3 $\frac{1}{2}$ c c of very active L D flagellate culture by stomach tube	Pithed 3 $\frac{1}{2}$ hours	No L D seen in stomach, gut or viscera fresh preparations and films
14	13th Feb	Big frog 2 $\frac{1}{2}$ c c of very active L D flagellate culture by stomach tube	Pithed 20 mins	Scanty L D flagellates some still motile in stomach and gut In viscera nil
15		Big frog 3 $\frac{1}{2}$ c c of very active L D flagellate culture by stomach tube	Pithed 36 mins	Scanty motile L D flagellates in stomach In viscera nil
16		Big frog 3 c c of very active L D flagellate culture by stomach tube	Pithed 38 mins	Scanty motile L D flagellates in stomach In viscera nil
17		Big frog 2 $\frac{1}{2}$ c c of very active L D flagellate culture by stomach tube	Pithed 49 mins	Scanty motile L D flagellates in stomach In viscera nil

TABLE VIIA
Kala-azar Spleen Juice, etc Animals, 1921-1922
 A Injections only

Serial No	Date	Details of Experiment	Date	Results	
<i>Monkeys</i>					
1	23 12 20	M rhesus male 2 c.c. of washed corpuscles from patient with scanty parasites in peripheral blood intraperitoneally	26 1 21 9 2 21 14 3 21 22 5 21 10 7 21 18 1 22 26 2 21	Weight increased Blood culture negative. Blood culture negative Weight increasing Spleen enlarged Spleen puncture, films + L D Spleen puncture films negative, culture + L D Spleen and liver punctured Cultures negative Animal alive and well Blood culture negative	±
2	15 1 21	M rhesus female 5 cc ++ pm spleen emulsion intravenously	16 3 21 30 3 21 20 4 21 21 8 21 20 10 21	Spleen enlarged Spleen puncture, films negative Spleen and liver enlarged Spleen and liver punctured, films and cultures negative Spleen puncture films negative cultures positive + L D Liver puncture cultures positive, + L D Liver puncture films and cultures negative	±
3	15 1 21	M rhesus female 10 c.c. of ++ pm spleen emulsion intraperitoneally	10 2 21 14 3 21 6 4 21 17 6 21	Liver puncture films and cultures negative Liver puncture films and cultures negative. Liver puncture films and cultures negative. Liver puncture films and cultures negative	—
4	15-1 21	M rhesus male 2 c.c. of ++ pm filtered spleen emulsion subcutaneously into forehead	10 2 21 14 3 21 1-4 21 17-6 21	No signs of local or general disease. Died of tuberculosis	—
5	15 1 21	M rhesus female. 10 c.c. of ++ pm spleen emulsion, intraperitoneally	17 1 21	Died of peritonitis	—
6	16 21	M rhesus 10 c.c washed corpuscles from case with parasites in peripheral blood	1 5 21 27-5-21	Spleen and liver punctured Films and cultures negative Died suddenly A hydatid cyst of the lung had burst into the bronchi and choked him	—
7	17 1 21 7-4 21	M rhesus male 10 c.c. of filtered ++ pm spleen emulsion intraperitoneal 10 c.c. of ++ pm spleen emulsion intraperitoneal and intravenous	14 3 21 17 6 21	Liver puncture, films and cultures negative Liver puncture films and cultures negative	--
8	17 1 21 11 4 21	M rhesus male 2½ c.c. ++ spleen emulsion subcutaneously 10 c.c. of ++ pm spleen emulsion intraperitoneal and intravenous	11 4 21 12-4 21 Died	Liver puncture, films and cultures negative T B foci in lungs Films from viscera, no L D	—
9	7-4 21	M rhesus male. 10 c.c of ++ pm spleen emulsion intraperitoneal and intravenous	24-5 21	Died after six weeks of generalised tuberculosis	—

TABLE VIIA—(contd)

Serial No	Date	Details of Experiment	Date	Results	
<i>Monkeys —(contd)</i>					
10	5 21	M rhesus 5 cc of washed corpuscles from an "infected" monkey = No 1, above, intraperitoneal and subcutaneous	8 21	Liver puncture, films and cultures negative	—
11	5 21	"Hunuman" monkey 5 cc washed corpuscles from k-a case, intraperitoneal and intravenous	8 21 <i>et seq</i>	Liver puncture films and cultures negative	—
12	5-21	M rhesus 5 cc of ++ pm spleen emulsion, intraperitoneal and intravenous	8 21 <i>et seq</i>	Liver puncture films and cultures negative	—
13	5 21	"Hunuman" monkey 5 cc. of ++ pm spleen emulsion intraperitoneal and intravenous	9 21	Liver puncture films and cultures negative	—
14	6 21	M rhesus 10 cc of ++ pm spleen emulsion, intraperitoneal	9 21	Liver puncture films and cultures negative	—
	20 9 21	Re-inoculated with fresh spleen emulsion intraperitoneally	20 9 21	Died immediately after injection, ? anaphylactic shock	
15	22-5 22	M rhesus, adult female ++ pm spleen emulsion 20 cc intraperitoneal 10 cc into liver 2 cc each eyebrow	11 7-22 1-8-22 28 12-22 6 1 23	Liver puncture films and cultures negative Killed Viscera films and cultures negative	±
16	22 5-22	M rhesus, adult male ++ pm spleen emulsion 20 cc intraperitoneal, 10 cc. into liver, 2 cc each testis, 1½ cc each eyebrow	11 7-22 28 7 22 29 7 22 29-7 22 3 8 22 28 8 22	Liver puncture films negative cultures + L D Blood films and aldehyde test negative. Blood films negative. Blood films after Echis venom, negative Blood films after Echis venom, negative Very emaciated Chloroformed Films and cultures from viscera negative Cause of death, ? beriberi	—
17	28 10 22	M rhesus, adult female ++ pm spleen emulsion 20 cc intraperitoneal, 10 cc into liver	30 12-22	Liver puncture, films and cultures negative	—
	25 12-22	++ pm spleen emulsion 20 cc intraperitoneal, 4 cc into liver			
18	27 11 22	M rhesus, young female ++ pm spleen emulsion 20 cc intraperitoneal, 4 cc into liver	4 12 22	Chloroformed when ill Pyæmia found	—
19	25 11-22	M rhesus, adult female ++ pm spleen emulsion from Monkey No 24, Table VIB 30 cc intraperitoneal, 4 cc. into liver	26-11-22	Died, septic peritonitis Films and cultures not taken	—
20	25-11-22	M rhesus, adult female ++ pm spleen emulsion from Monkey No 24, Table VIB 30 cc intraperitoneal, 4 cc. into liver	4 12-22	Chloroformed when very ill Pyæmia present Films negative, no cultures taken	—
21	25 11 22	M rhesus, young female ++ pm spleen emulsion from same monkey 25 cc intraperitoneal, 4 cc into liver	28 12 22 16-1 23 23 2-23 31-3 23	Liver puncture, films negative, cultures + L D	+

TABLE VIIA — (concl'd)

Serial No	Date	Details of Experiments	Date	Result	
<i>Monkeys—(contd)</i>					
22	27 11 22	M rhesus, adult female ++ p.m. spleen emulsion 25 c.c. intraperitoneal, 5 c.c. into liver, 5 c.c. subcutaneous	28 11 22	Died, septic peritonitis. Films and cultures not taken	—
23	4 12 22	M rhesus, adult female. ++ p.m. spleen emulsion, 17 c.c. intraperitoneal	30 12 22	Liver puncture. Films and cultures negative.	—
			4 1 23	Died? from beriberi. Films and cultures from viscera negative	—
<i>Dogs</i>					
1	17-8-21	"Kala," black female puppy 4 c.c. washed corpuscles from case with parasites in peripheral blood into peritoneum	21 9 21	Died in an emaciated state. No Leishmania in films or cultures. Liver films showed mononucleate forms, probably cryptococcus, n ^{sp}	—
2	17-8 21	"Azar" brown male puppy 4 c.c. washed corpuscles intraperitoneally as in No 1	8 12 21	Killed in emaciated state. Liver films = scanty L.D. +	+
3	5 9 21	"Leishman," black and white male puppy ++ p.m. spleen emulsion 5 c.c. intraperitoneal	2 12 21	Died of piroplasmosis. No Leishmania in films before or viscera films after death.	—
4	5 9 21	"Donovan," black and white male puppy 5 c.c. emulsion of spleen, liver and bone marrow from Pup No 1 on p.m. intraperitoneally	9 12 21	Died suddenly. Spleen and liver enlarged. Films negative.	—
5	8 12 21	"Anti," red brown male puppy 5 c.c. of liver and spleen emulsion from Pup No 2, intraperitoneally	6-1 22	Killed "in extremis". Films and cultures of liver, spleen, bone marrow negative	—
6	9 12 21	"Mony," white male puppy 5 c.c. of liver and spleen emulsion from Pup No 4 intraperitoneally	5 5 22	Liver puncture, films and cultures negative. Films show mononucleate forms? Cryptococcus	—
			1 12 22	Killed. Films and cultures from viscera negative.	—
7	6-1 22	"Leonard" liver and white male puppy 5 c.c. liver and spleen emulsion from Pup No 5 intraperitoneally	31 3 22	Died. No L.D. found in films from organs, but a heavy endomyces infection in the bone marrow	—
8	17 1 22	"Rogers," brown and white female puppy 10 c.c. ++ p.m. spleen emulsion intraperitoneal, 2 c.c. subcutaneously in abdomen and thigh	-4 22	Died in wasted condition. Films and cultures negative. Endomyces infection present in liver	—
9	17-1 22	"Fran," liver and white male puppy. Same injections as No 8 + 1 c.c. intravenously	5 5-22	Liver puncture, films and cultures negative. Ulcer over site of subcutaneous injection formed, but healed	—
			10 7 22	Died. Films from viscera all negative	—
10	22 5 22	"Chini" white female puppy ++ p.m. spleen emulsion 20 c.c. intraperitoneal, 15 c.c. into liver	12 7 22	Liver puncture, films negative, cultures + L.D.	±
			28 7 22	Peripheral blood films negative, aldehyde test negative	—
			29 7 22	Peripheral blood films after injections of Echis venom negative.	—
			3 8 22	Liver puncture, films and cultures negative	—
11	28 10 22	"Sergeant" adult female dog ++ p.m. spleen emulsion, 20 c.c. intraperitoneal, 4 c.c. into liver	29 8 22	Chloroformed when in good condition. Films and cultures of viscera negative.	—
<i>White Rats</i>					
1	17 3 21	Spleen pulp into scrotal sac.	10 days	Killed. Viscera films negative.	—
2	17 3 21	Ditto	3 weeks	Ditto	—
3	17 3 21	Ditto	5 "	Ditto	—
4	17 3 21	Ditto	8 "	Ditto	—
5	19 3 21	Spleen pulp into peritoneum	10 days	Ditto	—
6	19 3 21	Spleen pulp intraperitoneal and subcutaneous	8 weeks	Ditto	—
7	21 3-21	Spleen pulp into scrotal sac.	10 days	Ditto	—

TABLE VIIA—(contd)

Serial No	Date	Details of Experiments	Date	Result.	
<i>White Rats—(contd)</i>					
8	21-3-21	Spleen pulp into peritoneum	14 days	Suspicious forms in liver smear, but culture negative ? Cryptococcus	—
9	21-3-21	Spleen pulp, intraperitoneal and subcutaneous	5 weeks	Killed Films from viscera negative	—
10	22-3-21	Spleen pulp into scrotum	3 weeks	Died Films from viscera negative	—
11	22-3-21	Ditto	5 "	Killed Viscera films negative	—
12	23-3-21	Ditto	2 months	Ditto	—
13	23-3-21	Ditto	2 "	Ditto	—
14	31-3-21	Spleen pulp into peritoneum	2 months	Ditto	—
15	7-4-21	Spleen pulp into scrotum	3 weeks	Ditto	—
16	7-4-21	Spleen pulp into peritoneum	6 "	Died Ditto	—
17	17-4-21	Spleen pulp into scrotum	4½ "	Died Ditto	—
18	5-5-21	Spleen pulp into scrotum	4 weeks	Killed Ditto	—
19	22-5-22	++ p.m. spleen emulsion 5 c.c. into peritoneum, 1 c.c. each testis	3 months	Killed Films and cultures from viscera negative	—
20	22-5-22	++ p.m. spleen emulsion 5 c.c. into peritoneum, 1 c.c. each testis	3 months	Killed Films and cultures from viscera negative	—
<i>White Mice (Japanese)</i>					
1	7-4-21	Spleen pulp into peritoneum	10 days	Killed Films from viscera negative.	—
2	17-4-21	Spleen pulp intraperitoneal and subcutaneous	10 "	Ditto	—
3	17-4-21	Spleen pulp intraperitoneal and subcutaneous	3 weeks	Ditto	—
4	17-4-21	Spleen pulp intraperitoneal	6 weeks	Died Films from viscera negative	—
5	5-5-21	Ditto	2 days	Died of sepsis	—
6	6-5-21	Ditto	4 weeks	Killed Films from viscera negative.	—
7	22-5-22	++ p.m. spleen emulsion 2½ c.c. intraperitoneal	16-11-22	Killed Films negative. Cultures = LD +	—
8	22-5-22	++ p.m. spleen emulsion 2 c.c. intraperitoneal	26-5-22	Died of sepsis Films negative	—
9	22-5-22	++ p.m. spleen emulsion 2 c.c. intraperitoneal	26-5-22	Died Sepsis	—
10	1-6-22	++ spleen puncture fluid subcutaneously	28-8-22	Killed Films and cultures of viscera negative	—
11	3-6-22	++ spleen puncture fluid subcutaneously	1-9-22	Died Viscera films shew bacteria only No cultures taken	—
12	6-6-22	++ spleen puncture juice from 3 patients 2 c.c. subcutaneously	19-9-22	Killed Viscera films and cultures negative	—
13	13-6-22	½ c.c. ++ spleen juice subcutaneously	15-1-23	Killed Films and cultures negative	—
14	13-6-22	½ c.c. ++ spleen juice from two patients subcutaneously	15-1-23	Killed Films and cultures negative	—
<i>Miscellaneous</i>					
1	22-5-22	Pigeon 5 c.c. of ++ p.m. spleen emulsion intravenously	22-5-22	Films at ½, 1, and 2 hours = no parasites seen	—
			3-7-22	Killed Films and cultures of viscera negative Halteridium +	—
2	22-5-22	Cock ++ p.m. spleen emulsion, 8 c.c. intravenously and comb infiltrated	11-7-22	Killed Viscera films and cultures negative No local lesion	—
3	28-10-22	Duck ++ p.m. spleen emulsion 10 c.c. intraperitoneally	29-10-22	Died Septic peritonitis	—
4	28-10-22	Adult female cat ++ p.m. spleen emulsion 20 c.c. intraperitoneal, 10 c.c. into liver	4-1-23	Died Coccidiosis Viscera films and cultures negative	—
5	5-4-21	Three Flying Foxes each injected intraperitoneally with ++ p.m. spleen emulsion	7-5-21	(a) Died Films from viscera negative	—
6			12-5-21	(b) Died Films from viscera negative	—
7			12-5-21	(c) Blood culture negative Animal escaped	—
8	24-3-21	Two Flying Foxes each injected intraperitoneally with spleen puncture fluid rich in LD bodies	10-4-21	(a) Died Viscera films and cultures negative	—
9			21-4-21	(b) Died Viscera films and cultures negative	—

TABLE VIIB
Feeding Experiments

Serial No	Date	Detail of Experiment.	Date	Result	
<i>Monkeys</i>					
24	22 5 22 23 5 22	Adult female M rhesus On both days chewed and swallowed two large pieces of fresh p m ka. spleen = LD ++ Each meal washed down with 30 c.c. thick emulsion of same spleen by stomach tube	11-7-22 1-8 22 25-11 22	Liver puncture Films and cultures negative. Liver puncture Films and cultures negative. Dying of acute dysentery Chloroformed Spleen enormous and fibrotic. LD ++ in spleen, liver, bone marrow, kidney and heart blood films Cultures = LD ++	+
25	28 10 22	M rhesus, adult female Fed on large pieces of fresh p m spleen LD ++, and 20 c.c. emulsion of same by stomach tube	30 12 22	Liver puncture films and cultures negative	-
26	25 11 22	M rhesus adult male ++ p m spleen of Monkey No 24 above Swallowed large pieces, and 10 c.c. of emulsion by stomach tube	28-12-22 13 1 23 20 1 23	Liver puncture Films and cultures negative Severe anaemia Peripheral films negative. Very ill Chloroformed Viscera films and cultures negative	-
27	27 11 22	M rhesus, adult female ++ p m spleen emulsion 50 c.c. by stomach tube (Some went down the trachea)	3 12 22	Died Pneumonia plus septicaemia Viscera films negative No cultures Degenerating L donovani in stomach?	-
28	27 11 22	M rhesus, adult male ++ p m spleen emulsion 15 c.c. by stomach tube. Some got into trachea choking fit	28 11 22	Died aspiration pneumonia. Films negative No cultures? Degenerating LD in stomach	-
29	4 12 22	M rhesus, adult male ++ p m spleen Swallowed and chewed pieces 30 c.c. emulsion by stomach tube	28 12 22 3 2 23 27 3 23	Liver puncture, films and cultures negative. Liver puncture, films and cultures negative Died of mesenteric TB Films and cultures negative	-
<i>Dogs</i>					
12	22 5 22 23 5 22	Pup Swallowed very large pieces of fresh p m kala-azar spleen with LD ++	12 7 22 1 8 22	Liver puncture, films and cultures negative	-
13	28 10 22	Adult female white dog Swallowed bits of p m ++ spleen and 20 c.c. emulsion by stomach tube	29 12 22	Killed Films and cultures from viscera and heart blood negative	-
<i>White Rats</i>					
21	18 5 22	Fed by capillary pipette on spleen puncture juice, LD ++	28-8 22	Killed. Films and cultures negative.	-
22	25 5 22	Fed by capillary pipette on spleen puncture juice, LD ++	4 11 22	Died Films shew bacteria only No cultures	-
23	22 5 22 23 5 22	Both days Fed on ++ p m spleen emulsion by fine catheter	16 1 23	Killed. Films and cultures negative.	-
24	31 5 22	Fed on ++ spleen puncture fluid by catheter attached to sringe	21 6 22	Died Films and cultures negative. Encysted tapeworm in spleen	-
25	2 6 22	Fed on ++ spleen puncture fluid by catheter attached to syringe	28-8 22	Killed Films and cultures negative.	-
26	28 10 22	p m ++ spleen emulsion 4 c.c. by catheter	11 11 22	Found dead Films shew bacteria only No cultures	-
<i>Miscellaneous</i>					
10	22 5 22 23 5 22	Half grown cat fed on large pieces of fresh p m kala-azar spleen, LD ++	26 5 22	Died. Films shew bacteria only No cultures taken	-
11	22 5 22 23 5 22	Haw. Fed on both days on bits of same spleen	19 7 22	Died Films and cultures negative	-
12	28 10 22	Adult female cat 20 c.c. of fresh ++ p m spleen emulsion by stomach tube	1 1 23	Killed Films and cultures negative.	-

TABLE VIII
Transmission Experiments
(A) With Bed Bugs, *Cimex rotundatus*

Date	Nature of feed	Results.	Animal Test	Results
April 1921	About 40 fed on infected Monkey No 1 of Table VII Bugs fed at different stages of their existence some only once some repeatedly	Subsequently starved for period varying from 4 days to a month and then fed on.	(a) Young female M rhesus Monkey I. (b) Male "hunuman" monkey Monkey II.	Liver puncture of both at 2, 4 and 6 months Films and cultures negative.
March April 1921	Spleen puncture fluid, etc., from kala-azar cases injected into ligatured scrotum of white rats so as to form bullæ under the skin vide Table VII (a) White rats. 25 bed bugs of different ages fed on injected sites	Kept for varying intervals and then fed on	Monkey III Young male M rhesus	Liver puncture after 3 months, films and cultures negative Killed at 6 months Films showed mononucleate forms? <i>Cryptococcus</i> Cultures negative.
<i>Kala Azar Work, 1922. Bed Bug Experiments</i>				
16th June 1922	30 bugs fed on flagellate culture plus citrated blood in feeding tubes Kept at 22°C	2 shewed flagellates next day 6 dissected, 3rd day Thick tails seen	Mouse 1 Received 15 crushed bugs, 3rd day Mouse 2 Fed on 8 of these bugs, 3rd day	Killed 16th January 1923 Films and cultures negative Died 15th January 1923 Films negative (bacteria) No cultures taken
21st June 1922	Collection of bugs fed on flagellate culture plus citrated blood in tubes Kept at room temperature	Infected by fungi Died.		
29th June 1922	Collection of bugs fed on flagellate culture plus defibrinated rabbit blood in tubes Kept at 22°C	Dissections positive, flagellates and thick tails and ring forms 5th to 9th days.	Mouse 3 Received 3 crushed bugs hypodermically Mouse 4, 6 bugs rubbed into scarified skin Mouse 5 Fed on 6 of these bugs Mouse 6 Fed on 6 of these bugs.	Died 10th August 1922 Negative Died 4th August 1922 Negative Killed 14th October 1922 Negative Died 15th January 1923 Films negative Bacteria +. No cultures
7th July 1922	12 starved bugs fed on k-a case with positive peripheral blood Kept in cool incubator	Negative		
25th July 1922	36 bugs fed on flagellate culture plus defibrinated rabbit blood Kept at room temperature	Died from fungus infection		
1st August 1922	6 bugs found in bedding of k-a. case in hospital, dissected	Nil		
9th August 1922	Large collection of starved bugs fed on untreated k a case with positive peripheral blood Kept at 27°C	Many dissected over next 9 days, nil		
18th August 1922 22nd August 1922	Large collection of starved bugs fed on (a) k-a spleen puncture fluid plus patient's blood, (b) on flagellate culture plus defibrinated rabbit blood Mixed by accident Lot (a) kept at room temperature, Lot (b) kept at 27°C	No development found in first five dissected	Mouse 7 Received 5 crushed bugs hypodermically Mouse 8 5 of these bugs rubbed into scarified skin Mouse 9 Fed on 5 of these bugs	Died 14th November 1922 Negative Killed 5th December 1922. Films and cultures negative. Died 1st January 1923 Films negative Bacteria only Cultures not taken

TABLE VIIIB
Conorhinus and other Feeds

Date	Nature of feed.	Results.
1st February	Eight leeches fed on blood of k a case with 24 parasites in 7 films	Leeches kept at 22°C, dissected, up to 14th day No parasite seen
1st April	Adult female <i>Conorhinus</i> fed well on k a case with positive peripheral blood Kept at room temperature	Dissected, 3rd day R B Co. in gut but no parasites seen
25th April	Two newly hatched <i>Conorhinus</i> fed on k a case with positive peripheral blood Kept at room temperature	Both dissected 7th day Results nil
2nd May	Newly hatched <i>Conorhinus</i> fed on k a case with positive peripheral blood Kept at 22°C	Dissected 8th day Results nil
5th May	Young <i>Conorhinus</i> nymph fed on k a case with positive peripheral blood Kept at 22°C	Dissected 6th day Results nil

Date	Name of feed	Results
9th May	Large, adult <i>Conorhinus</i> took full meal from k a case with positive peripheral blood Kept at 22°C	Dissected, 10th day Remains of blood meal still in gut but no parasites found
18th September	Collection of <i>Conorhini</i> and <i>Stegomyia</i> fed on k a spleen emulsion plus patient's defibrinated blood in feeding tubes Lot (a) Kept at room temperature Lot (b) Kept at 22°C	Subsequent examinations by Dr Strickland, reports nothing found on dissection
13th November	30 <i>Conorhini</i> fed on spleen juice plus patient's defibrinated blood (a) kept at room temperature, (b) kept at 22°C	Results nil
16th November	12 <i>Conorhini</i> fed on peripheral blood of k a case with parasites in films	Results nil
21st November	Collection of <i>Conorhini</i> fed on patient with positive peripheral blood	Results nil
27th November	Collection of <i>Conorhini</i> fed on fresh p m k a spleen emulsion in bug feeding tubes	Results nil

TABLE VIIIC
Miscellaneous Experiments

Date	Possible medium of transmission	Source of infection	Animals to which transmission was attempted	Results
April to August 1921	Faecal urinary etc., contamination possibility Also flying blood sucking insects	No 1 infected monkey (Table VIIA), kept louse free	Female <i>M. rhesus</i> kept in same cage for 4 months. Kept louse free	Liver puncture at 4 and 6 months Films and cultures negative
May to August 1921	Faecal, urinary, etc., blood sucking insects, lice	No 2 infected monkey (Table VIIA), louse-infected	Young male <i>M. rhesus</i> also louse infected, kept in same cage for 3 months	Died wasted Films from viscera negative
May to August 1921	Faecal plus flying blood sucking insects	No 2 infected monkey, louse infected	Male <i>M. rhesus</i> kept in adjacent cage for 3 months	Liver punctures, at 3 and 6 months Films and cultures negative

Current Topics.

Treatment of Cases as a Prophylactic Measure in Kala-azar

A PAPER read at the annual 1923 meeting of the Assam Branch of the British Medical Association on the work of the special kala-azar staff in Assam by Lieutenant-Colonel T C. McCombie Young, R.M.S., is one which will command general interest. As the paper is published in full elsewhere, (Proceedings of the Assam Branch, B M A., Jan., 1923)—we here give only a précis of it. After dealing with the well-known history of the disease in Assam Colonel Young went on to comment upon the introduction of the tartar emetic treatment into India, the credit for which undoubtedly belongs to Sir Leonard Rogers. Clinically his results were confirmed by Muir at Khulna and by Dodds Price at Nowgong. The introduction of the method in Assam is undoubtedly due however

to the Public Health Department of the Province, which created the special kala-azar hospital at the Shillong Pasteur Institute in 1917 for the study of the disease and its treatment. Knowles' dictum that a total course of 200 cc of a one per cent solution of potassium antimony tartrate intravenously "seemed to be sufficient to sterilize the patient from infection" has been very adversely criticised and it is now clear that many cases require a much more prolonged treatment, whilst in many of the so-called "antimony-fast" cases the want of success may apparently be due to hesitation in commencing the treatment, and to a lack of boldness in pushing the dosage at its commencement. It is now clear that Knowles was wrong yet the circumstances of the time may be recalled the treatment was on experimental trial, Knowles' reports of 1918 and 1920 were of a preliminary character only, the Assam Administration was waiting for the reports, and the dictum was based upon the fact that in 31 patients thus treated in Shillong, and in a good hill climate, after a course of 200 cc of the one per cent solution, the spleens were still large enough to puncture, and yielded negative findings in both films and in N N N cultures.

The kala-azar survey work in Assam dates from its first beginnings in 1910 in the Golaghat sub-division. In 1917, Sibsagar became infected, apparently from Nowgong, and a repetition of the terrible 1890-1900 epidemic was feared. It is curious to note that the intervening sub-division of Jorhat was missed by the disease, and remains to this day free from infection, although surrounded by infected districts. A study of comparative features in Jorhat and Sibsagar should throw some light upon the epidemiology of the disease and is urgently called for.

In 1917 coincidentally with the trial of the new treatment at Shillong by Knowles and at Nowgong by Dodds Price, the first of the special temporary kala-azar hospitals was opened at Mitha Pukri near Nazira. From this small beginning operations have become so widespread that in 1922 the special kala-azar staff treated 19,659 persons alone, a saving of at least 17,690 lives which would otherwise have been lost. Moreover, whereas at the permanent civil hospitals and dispensaries of the Medical Department in the infected districts there are usually only some six or seven cases per hospital under treatment at any one time, in the adjacent temporary special kala-azar hospitals each can shew from 150 to 200 cases under treatment simultaneously, as the result of survey operations, the inspection of suspected villages, propaganda work and the seeking out of cases,—a policy impossible to an already burdened civil surgeon. It may seem with the steady increase each year of cases under treatment and of deaths from kala-azar reported in the Province that the disease is on the increase, but the true facts are otherwise: the truth is that whilst the disease is rampant and in full vigour, the co-ordinated operations against it have reached their maximal effort and the disease is at present held in check and may hereafter be overcome and exterminated. Colonel Young contended that these results have been accomplished only as the result of the introduction and perfection of this special organisation.

The most interesting part of his paper, however, is its collection of statistics dealing with the value of treatment of cases in preventing the spread of the epidemic. The contrast between pre-treatment and treatment days is striking. Thus Reoti-Kopohna, a village in Sibsagar, became infected, apparently in 1914. By 1917, 66 cases had occurred in 32 families, with 30 deaths. Evacuation measures were then commenced, and six families moved to a new site in March, 1917, seventeen more in December, 1917, nineteen more in March, 1918, fifteen more in November, 1918, and the remaining twelve in February, 1919. Out of a population of some 400 souls, about 100 deaths occurred before the treatment became available, and the segregation measures cost Government some Rs 15,000. In August 1919 the kala-azar hospital at Nazira was opened, and by November 1922 all cases had been treated. The village has since remained apparently absolutely free from infection.

It was instances such as these which led to the opening up of temporary hospitals throughout the epidemic areas as a prophylactic measure. "In Sibsagar sub-division," records Colonel Young, "the results have been very carefully watched since 1920, when a number of new infections in villages came to under observation, were labelled 'treatment-observation villages,' and every effort made to deal by treatment with all new cases as they occurred. The results are, on the whole, encouraging. They suggest that early treatment of the first one or two cases controls the outbreak. In some cases it appears to extinguish it entirely, whilst in all cases it appears to prevent its assuming extensive proportions. The figures shew that where only one new case comes under observation and treatment during the first year, there seems to be quite a reasonable chance that no more cases will come to light, but where the number of cases detected in the first year is considerable, and it is evident that a considerable degree of site infection is established, the numbers seem to keep up." Statistics follow which shew that in fifteen villages

which shewed in all twenty-seven cases in 1920, the immediate treatment of these twenty-seven cases was followed in each instance by the complete absence of kala-azar from the village during the next two years. In other villages where four or fewer cases were first discovered and treated, the number of cases steadily declined in 1921 and 1922, but where the number of initial cases discovered in 1920 or 1921 was ten or more the infection increased. These results with treatment as the only prophylactic measure may be compared with such figures as those for Hudupara, where out of 177 persons, 98 acquired the disease in three years prior to the introduction of treatment.

Speaking to an audience of tea garden medical officers, and with special reference to the kala-azar problem as it affects the tea gardens of Assam, Colonel McCombie Young concludes—

"1 The labour force of any tea estate in Kamrup, Nowgong, Darrang, Sibsagar, or Sylhet may at any time become infected with kala-azar, as we do not know how to prevent the spread of infection.

2 If the first case or two can be discovered at an early stage and if cases are not permitted to remain unrecognised, and untreated in the lines until extensive site infection is established, on present indications there is a reasonable chance that an outbreak of kala-azar may be stayed by early treatment of cases, and that destruction of houses on a large scale and removal to a new site, with the heavy expenditure which it involves, may not be necessary.

3 When the number of cases in the first year or two is large, indicating that fairly widespread site infection has occurred, vacation of the infected site and removal to an uninfected site appear to be still necessary, to prevent a recurring crop of fresh cases which treatment will probably be unable to diminish.

4 When removal is effectively carried out the chances appear to be that one is justified in predicting that removal and treatment of cases will extinguish the outbreak."

A Fatal Case of Hæmorrhage in Kala-azar.

In the *Calcutta Medical Journal* for March, 1923, Dr Monindra Nath De records a case of fatal bral hæmorrhage in kala-azar. The patient was a Hindu female, 18 years of age, extremely emaciated, with a spleen almost filling the abdomen, a liver enlarged to three inches below the costal margin, œdema of the legs and an intensely foul smelling ulcer in the mouth between the tongue and the gum, nearly involving the whole of the left side. The blood picture, RBCs, 1,720,000 per cmm, total leucocytes 1,800 per cmm, and the clinical symptoms were those classical of the disease.

Treatment by intravenous injections of 2 per cent sodium antimony tartrate was commenced, and, as the patient could not eat and could barely speak, nasal feeding was adopted. In five days' time there was decided improvement, when—suddenly—at 8 p.m. blood commenced to ooze from the oral ulcer. Despite the injection of calcium chloride and horse serum, and local applications of adrenalin, turpentine, and stupes soaked in boiling water severe hæmorrhage continued. No particular vessel could be implicated, and despite every attempt at saving life the patient collapsed and died from hæmorrhage, after a total loss of some four pints of blood.

The Excretion of Antimony.

At a meeting of the Medical Section of the Asiatic Society of Bengal on Wednesday, the 9th of May, 1923, Dr U N Brahmachari read a paper on "Quantitative Studies in the Excretion of Antimony."

Dr Brahmachari pointed out that the curve of excretion of antimony by the kidneys after intravenous injection of an antimony salt was different in the case

of salts containing trivalent and pentavalent Sb respectively e.g., in the case of tartar emetic, trivalent, as compared with urea stibamine, pentavalent. In the former the rate of excretion was slow, in the latter it was rapid for the first 24 or 48 hours and thereafter followed a curve resembling that of trivalent antimony. In these respects antimony behaved in a manner similar to arsenic, and he concluded that, after intravenous injection of such an organic compound as urea stibamine, the antimony was first excreted as pentavalent Sb, and then converted in the body into trivalent Sb, after which its rate of excretion resembled that of excretion of trivalent Sb compounds.

In the case of tartar emetic the amount excreted by the kidneys during the first 24 hours did not exceed 6 per cent of the dose injected, whereas in the case of urea stibamine it might be as much as 50 per cent. He held the view that in the process of conversion of urea stibamine into a trivalent compound, it was converted into a *reactive* trivalent compound, and that upon this depended the great therapeutic value of urea stibamine.

Dr Brahmachari then proceeded to discuss the influence of the basic radicles of an antimonyl tartrate upon its excretion, and shewed from the observations that the solubility of an antimonyl tartrate influenced its excretion by the kidneys.

In a discussion on Dr Brahmachari's paper Major H W Acton, I M S, asked what was the percentage of technical error in the Sb titration in urine and faeces? He and King, working at the Medical Council Research Laboratories at Hampstead for five months on the excretion of quinine, had found that it was sometimes impossible to exclude as large a technical error as 20 to 25 per cent. No titrations were more difficult. Dr N R Chatterji asked what products had been isolated to prove that urea stibamine was excreted as Sb in pentavalent form? The big molecules of pentavalent Sb might perhaps not dialyse, and were therefore mostly excreted. Lieutenant-Colonel J W D Megaw, I M S, in dwelling upon the significance of the findings, asked whether investigations had shewn the relationship between rate of excretion, safety and therapeutic value. In replying Dr Brahmachari said that attempts at titrating the Sb in the urine by colorimetric methods had been abandoned, as inaccuracies might arise from the Fe. normally present. Gravimetric estimations of Sb plus organic matter had been utilized throughout, and the results were accurate to within a technical error of 1 to 2 per cent. Pentavalent As followed the same rules of excretion. On conversion of pentavalent Sb in the tissues to nascent trivalent Sb, the latter might prove much more efficient than does trivalent Sb, originally injected as such.

Observations on the Pathogenicity of *Isospora Hominis*, based on a second case of Human Coccidiosis in Nigeria

By A. CONNAL, M.D.,

Trans. Royal Soc. Trop. Medicine and Hygiene,
Vol. XVI, No. 4, 1922, p. 223

EVER since the appearance of Dobell's classical monograph on the human *Coccidia* increasing attention has been paid to these parasitic protozoa of the human intestine. The pathogenicity of the *Coccidia* varies from the deadly *Eimeria stiedii* of the rabbit to the apparently harmless and very common *Coccidia* of sparrows and smaller birds. Hitherto it has been held that the four species of human intestinal *Coccidia* are harmless.

The case reported by Dr Connal is one of direct infection of a laboratory worker. Laboratory examinations were being conducted on the stools of a patient, who shewed infection with *I. hominis* from February 7th to 17th, 1922. On the 16th February a specimen of infected faeces was being shaken in a flask when the flask burst and the laboratory worker received the contents in his

face. The abrasions and the face were washed with lysol solution, but the mouth was not rinsed.

Six days later, the observer was awakened at 5 a.m. with diarrhoea, which persisted from February 22nd till March 24th. From March 16th to 24th the stools shewed oocysts of *Isospora hominis*. Thus in this instance clear evidence is apparently forthcoming both of the pathogenicity of *I. hominis* and of the incubation period after a heavy infection.

The writer notes that, in addition to the coccidial oocysts Charcot-Leyden crystals were also found in the stools on several occasions. These crystals are of great interest in faecal examinations. Formerly it was held that their presence in the faeces was associated with helminthic infections. Later, thanks to the researches of Acton and of J. G. Thomson it was shewn that the finding of these crystals in the stools was almost, if not quite pathognomic evidence of previous or existing infection of the colon with *Entamoeba histolytica*. In the present instance the crystals were repeatedly found, although *E. histolytica* cysts could not be found, even by concentration methods.

The infection caused no symptoms other than a troublesome diarrhoea, which responded to bismuth salicylate and charcoal administration. The author's paper closes with a clear and useful summary of the literature on human coccidiosis and on Charcot-Leyden crystals in the stools. He inclines to the view that the recent numerous reports of *I. hominis* and the other human *Coccidia* may owe their origin to the awakening of a local focus of infection in the Mediterranean war areas from 1915 onwards. A most useful and complete list of the references to human coccidiosis in the literature completes a very interesting paper, which should be studied in the original by every laboratory worker in India.

Diet and work in India

By A. H. A. SIMCOX

The Medical Press and Circular, 3rd Jan., 1923, p. 12.
(Correspondence)

THIS is a letter which will interest every medical practitioner in India. We are all familiar with the "dawa" tradition, with the view that what will cure the patient is a bottle of medicine. What is less often realised is that the Indian masses live upon an economic level which too often represents semi-starvation. Taken in the main Indian labour is accused of being apathetic, slow and inefficient. The cause is often set down to almost universal ankylostomiasis infection but is this so?

The author records the results of an enquiry undertaken by "a senior officer of the I. M. S. and the superintendent of a great Government chemical factory" into this problem. They concluded that "among considerable bodies of men physically sound and of considerable intelligence, and drawing assured pay at standard rates" almost the entire family income was expended on food. "Education clothing and pleasure were reduced to a minimum." "The labouring man in India cannot maintain himself in efficiency, his wife and children in robust health on his wages. The quantity and quality of food which he can buy is not enough to enable him to do a consistent fair day's work. Men receiving pay above the minimal line could and did afford themselves and their families sufficient nourishing food before they indulged in pleasure of luxury. Men below the line could not afford what I may term an efficient diet."

The author's views are undoubtedly, in the main, correct. The Indian masses may suffer from ankylostomiasis, but, in the main—and especially with regard to the poorer class of Government servant,—they suffer from under-nutrition. The matter is not, perhaps, quite as simple as the author considers caste customs and improperly balanced diets are of importance. Yet we think that most medical men in India will agree with the author that the Indian masses suffer more from under-nutrition than from disease, which is often its

sequel Yet India is a land of almost immeasurably potential wealth, could such wealth be marketed in terms of the all-pervading "Rupees, annas and pies" The fact that five out of every six conversations between Indian coolies of the poorer classes concern this inevitable topic is evidence strongly in favour of the writer's contention

The Etiology and Treatment of Psoriasis.

By W GRIFFITH, M B, Ch B,

Transactions and 11th Annual Report of the London Dermatological Society, 1922, p 31

DR. GRIFFITH'S paper is a useful resume of a difficult subject As to the etiology of psoriasis "we are entirely in the dark" A theory of diathetic origin, as well as one of neuropathic origin are equally confessions of ignorance Nevertheless several facts concerning the etiology of the disease are brought to light if it be carefully studied These are (a) a frequent hereditary or familial history, (b) it is more prevalent in some climates than in others, *e.g.* in the damp and cold climates of Iceland and England than in the drier climates of France and Central Europe, (c) it affects those areas of the body which are especially exposed and require protection from climatic conditions, *e.g.* the head and dorsal aspects of the trunk, (d) it is essentially a disease of the healthy and often seasonal in appearance, often recurring during the autumn or during a cold, damp spring The author considers that such characteristics suggest an atavistic tendency and not a disease acquired by an individual "the non-scaly human skin is an evolution to benefit man it may well be that in psoriasis, we see an attempt to form a protective scaly covering in damp, cold climates, the idea that it is an acquired disease is untenable, it is much more probable that it is a reversion to an ancestral type of skin" (Yet we doubt whether experience in India will bear out this statement)

With regard to treatment it is very difficult to estimate the value, if any, of internal remedies The eruption has its own periods of progression and retrogression No two cases behave alike, and psoriasis patients are ideal ones for therapeutic enthusiasts and charlatans The author records a psoriasis case with arsenical pigmentation, and yet with the psoriasis eruption still flourishing and another with a papulo-squamous syphilide plus psoriasis, the former having yielded to arsenobenzol, whilst the latter was untouched

Local remedies are far more efficacious, and of these chrysarobin is *par excellence* the best It causes intense hyperæmia and inflammation of the skin, whilst the patch of psoriasis rubs off and appears as a pale area surrounded by a halo of redness Radiant light and vapour baths are also of secondary usefulness X-rays are of dubious utility and not free from risk Change of climate will often entirely clear the condition

Certain Limitations of the Bacillus Coli method in water examinations.

By RAO SAHIB V GOVINDA RAJU,

Assistant Professor, Calcutta School of Tropical Medicine

Jour of Hygiene, Vol XXI, No 2, Dec, 1922

It is pointed out that the mere estimation of the number of B coli in drinking waters for testing their purity is occasionally apt to be misleading as under certain circumstances such as during stasis in reservoirs or flow through pipes they may undergo considerable in-

crease in numbers Such a possibility should always be borne in mind before concluding that their increase in a water is indicative of fecal pollution

NOTICES.

LONDON SCHOOL OF TROPICAL MEDICINE
EXAMINATION PASS LIST 71ST SESSION,
JANUARY TO MARCH, 1923

DISTINCTION—Harsant, A G, Duncan Medal, Briercliffe, R, Cook, C E, de Boer, H, Adcock, E W

PASSED—Han, C H, Rebello, A C, Simpson, R H, Godding, H C, Martin, C de C, Dhawan, M L, Wijeyeratne, J, Thomas, F S T, Ghosh, J M, Kelly, R W C, Jameson, W J, Walsh, P, Wilkinson, S A, Stockley, H G, Manfield, A H, Mucadam, Miss N R, Lupprian, E V, Krikorian, K S, Cross, B, Garewah, A C, Hodge, H P, Lindow, E D, Matthews, V

PHYLLOSAN

The introduction of this preparation for the treatment of anæmia and allied conditions with deficient hæmoglobin is of interest The work of Sir A E Shipley, Dr M O Forster, F.R.S., and others has shewn that there is a chemical relationship between chlorophyll and hæmoglobin, whilst Professor E Buerger, Director of Pharmacology at Berne University, has shewn that whereas chlorophyll decomposes into phylloporphyrin, of chemical formula $C_{54}H_{72}N_4O_6$, hæmatoporphyrin—the decomposition product of hæmoglobin has the chemical formula $C_{54}H_{72}N_4O_6$, whilst hæmopyrrole, $C_{54}H_{72}N_4$, can be derived from either source Green vegetables have long been recognised as of value in the treatment of chlorosis and allied conditions, but Professor Buerger's "Phyllosan" represents the extracted chlorophyll in concentrated form In such a preparation the chlorophyll is presented without the accompanying quantities of cellulose

Clinical reports confirm the claims made that the preparation is of considerable value in the treatment of anæmias of different causation, and that it appears to be even more efficient than are iron compounds One report claims that the recovery of hæmoglobin and R B C content of the blood is twice as rapid under Phyllosan treatment as under iron administration The Indian agents for the Chlorophyll and Chemical Corporation, who prepare the product, are Messrs G Atherton and Co, Clive Buildings, 8, Clive Street, Calcutta

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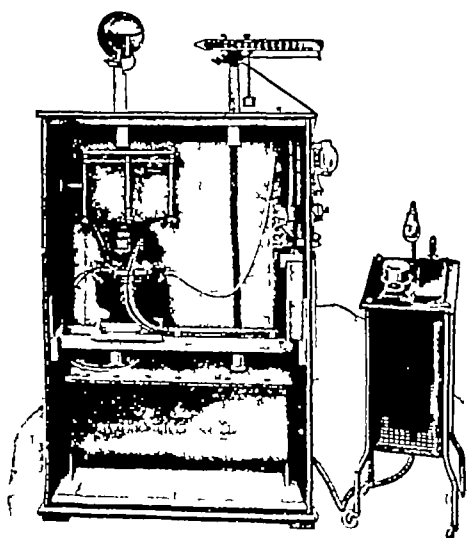
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Original Articles.

THE OPERATIVE TREATMENT OF FRACTURES

By H HALLILAY,

LT-COL., I M S,

Civil Surgeon, Simla

By the operative treatment of fractures I mean open operations involving incision of the soft parts and adequate exposure of the bone at the site of the fracture, and—usually—though not invariably, the fixation of the fragments, most frequently with Lane's plates and screws

Some 28 years ago Arbuthnot Lane read a paper before the Clinical Society of London dealing with the results of the treatment of simple fractures by operation, a paper which in the words of its author "raised a storm of opposition and has continued to do so up to the present time," (this was written in 1914 when the second edition of "Operative Treatment of Fractures" was still in the press) It would not be inaccurate to add that the echoes of that storm are heard even at the present day

I was amazed to hear only a few months ago an eminent colonial surgeon denouncing the practice of treating fractures by open operations and deploring the harm which such operative procedures had brought about In Bernard Shaw's amusing comedy "The Doctor's Dilemma" the old time surgeon, Sir Patrick Cullen, says "Chloroform has done a lot of mischief, Cully, it's enabled every fool to be a surgeon" all operative procedures may be a source of mischief if done wrongly—those who practice bone-plating and disregard all the warnings of him who evolved the technique of the operation will sooner or later come to grief, or at least their patients will, but that justifies no condemnation of the procedure so accurately defined by its inventor

Why is there, why should there be any question of the benefits of the operative treatment of bone fractures? There is only one answer,—sepsis,—sepsis is an almost irreparable disaster in this operation, it may be only an incident in others As Arbuthnot Lane himself says "the very moderate degree of cleanliness that is adopted in operations generally will not suffice when a large quantity of metal is left in the wound" The key to success in these operations is asepsis, how can asepsis be secured if the operator freely inserts an imperfectly sterilized hand into the wound thinly protected by a friable rubber glove, with the certain knowledge that if he tear his glove he infects the incisional area? Is not this a case where discretion is the better part of valour? Is it not here *par excellence* that total absti-

nence is preferable to moderation? In other words asepsis than the modified sepsis that satisfies the ideal of so many operators? Sir Arbuthnot Lane evolved his technique at a time when rubber gloves were not in general use,—latterly there has been a disposition in certain quarters to deprecate the necessity for "a special operative ritual" in bone-plating After all what is "the special operative ritual" as laid down by Lane?

It is only a very thorough application of aseptic principles where all possible sources of infection are excluded

If the operator will follow this technique conscientiously he need have little fear that the wound will become infected even after the introduction of many steel plates and screws

It may be said that no one disputes these facts, and that it is superfluous to labour the points that I have raised and the principles which were defined by Lane so long ago I might have thought so too were it not that I know that too often alas these rules are honoured more in the breach than in the observance

Too often the surgeon having fingered the wound all over, wrecked one or more pairs of gloves, will finish off when dealing with an oblique fracture by sawing away a large spike of bone, thus completing the sum of his offences against the true principles of the operation

A distinguished Argentine surgeon after visiting a famous Northern city where he had witnessed a renowned operator plating a tibia came away full of horror

"It was dreadful" he said,— "He rubbed his hands all over the wound, he did everything he should not have done, and nothing that he should have done You might have called it a demonstration of the way not to do a bone-plating, the only illuminating thing about it was his final remark—'these cases often come to amputation'"

Oddly enough and sadly enough I had already witnessed a similar scene in the operating theatre of a London hospital a short time before Hence it may not be so superfluous to insist upon these points as at first sight it might appear to be It is not more ruinous to run from a fight in the words of Kipling's old soldier, than it is to achieve sepsis in bone-plating

Any surgeon, when he has acquired a very moderate amount of experience of this particular operative procedure, will realize how very little the introduction of his fingers into the wound is going to help him, whilst he will very soon discover that the powerful instruments designed by the originator of the operation are very much more efficient tools than are the most capable human fingers Even if it were not so, a small sacrifice of efficiency would be a trifling price to pay to insure against the terrible danger of sepsis

One other point in technique—an illustration of things to be left undone. Take a match, divide it obliquely, separate the fragments, now reconstitute the fragments in the original form of the match. In an oblique fracture the problem is to get the points together. We will assume that the fragments are over-riding and that the efforts of the operator to replace them are being resisted by the pull of the muscle, can anyone explain how this object is to be brought about by sawing off of the broken points? It does not assist, but how often is it done with the result that the victim of ignorance is condemned to a permanent shortening of the limb? If the result of the operative treatment of fractures is to be shortening and deformity it would be very much better to leave the operation alone and to rely on older methods—the justification of an operation is its perfect result.

The problem of the operative treatment of fractures is like the solution of a jig-saw puzzle, it is "not done until the fragments are accurately replaced in their original form",—when this is done and the shape of the broken bone is restored we can await with confidence the full restoration of function.

My experience of this operation extends over 13 years and the results have been so gratifying that I have come to adopt the operation in all but the slightest cases of displacement as a routine treatment.

In many cases of fracture of the bones of the forearm of the shoulder joint, of the elbow joint, the ankle joint, it is often extremely difficult to obtain reduction of the deformity even in open operations. It is in such cases that one realizes that in Lane's words "the setting of fractures is a myth".

If any fractures in the human body should be amenable to non-operative treatment surely those occurring in the neighbourhood of the wrist or ankle should be so, as the bones concerned are subcutaneous and are easily amenable to forcible manipulations or "setting" and controllable in their whole extent by splints, and yet these are *par excellence* those in which the results are most deplorable.

A short time ago a well-known police surgeon stated that in his experience he had never known a police constable to return to duty after sustaining a Pott's fracture of the ankle.

Percival Pott himself in his classical description of the fracture associated with his name says "A case which gives infinite pain and trouble both to the patient and surgeon and very frequently ends in the lameness and disappointment of the former and the disgrace and concern of the latter".

Technique—I use stockingette tubes sterilized at 120°C and soaked in 1 in 1 000 corrosive sublimate or biniodide of mercury, of such size as will fit the limb snugly. The incision is made through the stockingette and the cut

edge of the material at once clipped to the margin of the skin incision. Another knife is then employed to complete the deeper dissection.

No tourniquet is employed as a rule by the time the operation is approaching completion the hæmorrhage has ceased, whereas if a tourniquet is used the end of the operation coincides with the beginning of hæmorrhage.

All spurting vessels are clipped with Mayo Oschner forceps, as a rule no ligatures are used—indeed in primary operations it is surprising how little hæmorrhage there is.

The site of the fracture having been exposed freely—and it often needs a very free exposure indeed,—the periosteum is elevated with a sharp rongeur—Ollier's is one of the best patterns. If this is done the "cambium" layer of the periosteum will be taken up with the periosteum and will subsequently form a sheath of callus under which the process of repair will take place once the fragments have been replaced in accurate apposition. The bone is then restored to its original form and the fragments are held in apposition by the powerful forceps designed for this purpose by the inventor whilst the holes are drilled. The plate is then screwed firmly down to the bone—the fascia is not as a rule sutured—and the wounds closed without drainage, either Michell's clips or silkworm gut are used to close the skin. All sutures are introduced by the needle holder and all knots tied by forceps. A thick pad of sterile wool is applied and firm pressure exerted by careful bandaging, splints are as a rule employed only until the stitches are removed and are then discarded.

Should any oozing of blood take place the outer layer of wool is removed, the blood stained area painted with tincture of iodine and a fresh aseptic dressing applied. Hæmorrhage, if the limb is firmly and accurately bandaged, is seldom to be feared in these cases, neither screws nor plates are touched by hand but are held by special instruments.

As a general rule it is well to apply the longest and strongest plates and screws that the bones can carry. Never if it can be avoided, use a short plate say with four holes of which two are adjacent to the line of the fracture. Should one of these become loose the plate will act as a hinge and rotation in the transverse axis may take place, as there is inevitable softening at the fracture margin owing to the process of repair and a screw may loosen on that account, allowing a certain amount of play between the two fragments with resulting union out of the right line of the bone.

Screws are popularly supposed to become loose owing to a strange disease called rarefying osteitis. Why not call these things by their proper names and describe them as sepsis or "dirty surgery"?

I believe that all cases of so-called rarefying osteitis in connection with bone plating are due to this cause and to this cause alone. I have known plates and screws to lie as they were placed for 12 years in a case of fractured radius without any trouble of any kind.

I have known overgrowth of bone to take place so that screws and plates were buried in new bone and not a trace of either was to be seen on the surface. The screws when removed were as firmly embedded as on the day on which they were introduced. These cases of bony overgrowth are rare except in children and are not I think very common even with them but they certainly cannot be put down to the account of rarefying osteitis.

There is as a rule no need to remove plates especially when they are safely buried under muscle. It may be necessary to remove plates when they are in situations which are exposed to pressure such as the ankle joint where a close fitting boot may cause discomfort.

One great advantage of bone plating lies in the fact that very early movements of adjacent joints are possible which obviate the stiffness and contracture which so often follow fractures when treated by external splints. Gentle movements of the joints are begun as soon as the stitches or clips have been removed. Ordinarily this is done on the 10th day. If the fractured bone has to carry weight as with the femur or tibia the patient is cautioned against putting his or her weight on the limb for at least three months.

Many results which would otherwise have been excellent are spoiled by too early subjecting the still plastic callus to the strain of carrying the body weight, such a strain in a heavy individual will cause even a stout steel plate to bend and the recent bony union with it.

Callus appears to be very resilient for a long time. I encountered a curious instance of this once in a case of fractured femur in which I

The wound healed by first intention and about a month or six weeks later the patient stated that something had "gone" in his thigh and complained of severe pain at the site of the fracture. There was nothing obviously wrong on external examination, no shortening or deformity but as he persisted in his complaints of pain it was decided to explore the site of the fracture.

On exposing the bone and plate the mystery was solved. The plate had fractured transversely in the middle between the third and fourth holes. The fragments were however attached to the femur by the screws and sound union had taken place between the fractured ends of the bone. The screws were firmly embedded and were only to be removed by employing strong pressure with the screw driver. The second wound healed by first intention and the patient returned to India with a perfect result.

There is no doubt, I think, that a spasmodic movement during his sleep had caused a sufficient movement of the ends of the bones, mortised though they were into the callus, to expose the plate to the strain which had snapped it. This incident illustrates the resiliency of callus and also emphasizes the desirability of employing the largest and stoutest plates that can be applied as I am convinced that very considerable movement is possible between the fragments when secured by short plates. Hey Groves has drawn attention to this danger in an article in the *British Journal of Surgery*.

In dealing with the periosteum reflect it with the soft parts, as by doing so the blood supply of this important membrane is secured and manipulation is carried on within the periosteal sleeve and all danger of injury to surrounding parts reduced to a minimum.

If the periosteum is separated from the surrounding soft parts this essential membrane is deprived of the greater part of its blood supply and the process of repair will be delayed.

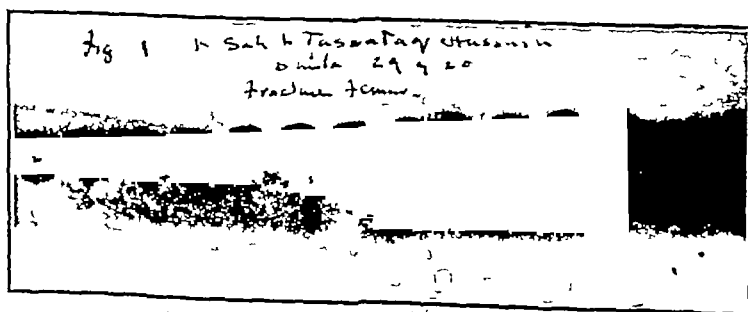


Fig 1—T H Simla 1920 Fracture of femur

had replaced the fragments in accurate apposition and secured them by means of a steel plate and screws. It was during the war and on the Persian Gulf we were temporarily short of plates of appropriate size and I was compelled to use a short but stout 6-hole plate.

ILLUSTRATIVE CASES

T H, CID, Simla, 1920 (Fig 1) Fractured his femur three months earlier, fell from his car at Dehra Doon, came to Simla with two and a half inches of shortening

Had just been permitted to walk on crutches when he fell in the bathroom and fractured it again. At the operation a great deal of soft and unsatisfactory callus was found. The ends of the bone having been cleared of all clogging callus with a sharp rongeur, the fragments were brought into accurate apposition and fixed with a very stout steel plate and screws in perfect position. Union resulted by first intention. On the 8th March, 1921, he writes "I get overwhelmed with gratitude to you every time I tread on *terra firma*. I started walking on the 3rd January, 1921 and can now walk without trouble." I saw him in March 1923. He has no trouble of any kind and can walk as well as ever. There is no shortening and the functional and anatomical results are perfect.

Mrs B, aged 70 (Fig 2) Badly comminuted fracture of the tibia and fibula



Fig 2—Mrs B, Simla, 1920. Spiral fracture of tibia. Fragments fixed in apposition 2 plates and screws

Operation in 1920. good anatomical and functional results. was able to walk without any pain at the time of her discharge from hospital.

Miss R, Pott's fracture three months earlier much lameness and disability. Quite unable to carry on her vocation of nurse. Foot in valgus position.

Operation. Ends of the bone cleared of callus and fragments secured in good position by two plates and screws. Union by first intention, plates subsequently removed. Excellent result. is now able to get about her work without any disability.

Lulu Ingram, aged 12 (Fig 3) Fracture dislocation of the right elbow Had been put

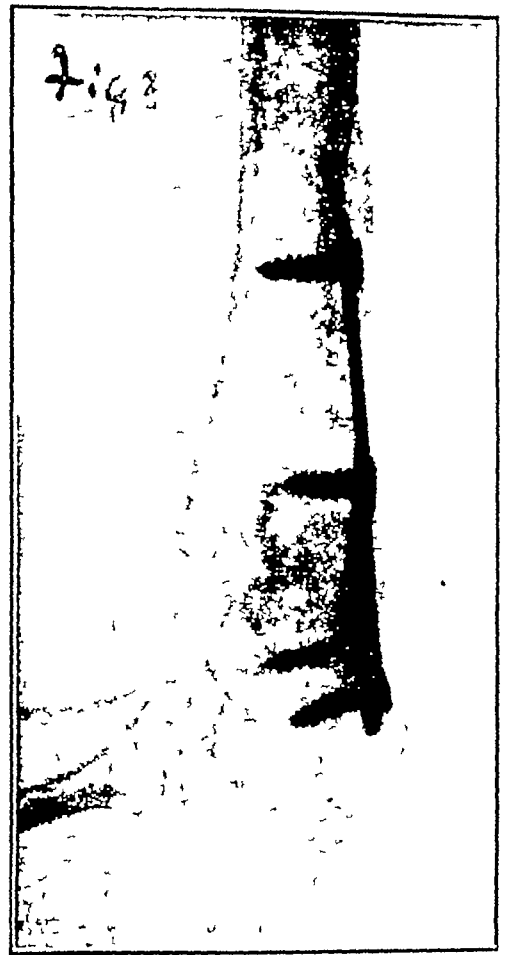


Fig 3—Lulu Ingram, Poona, August 1917. Fracture through both condyles through the joint

up in full flexion. No movements of joint, lower end of the upper fragment preventing flexion of the forearm. Operation in August 1917. Fragments brought into apposition and fixed with a Y-shaped plate. Union by first intention. plate removed one month after movements completely restored. Her mother writes in October 1919 to say that the movements are completely restored and that there is no deformity of the arm.

S L K, aged 42 Marwari Fell from motor car on to the right shoulder. Simla, October 1920. Operation.

The fracture of the head of the humerus was oblique, only a tiny portion of the shaft was attached to the upper fragment, which was practically all head. After great difficulty the fractured ends were brought into accurate apposition and fixed by a small plate and screws. union by first intention.

I saw this case in Calcutta in 1923. the functional and anatomical results were perfect. The patient assured me that as far as the operation was concerned the bite of a mosquito could not have given him less trouble.

Capt O, I M S, aged 30 (Fig 4) Fracture of both bones of the forearm by falling from his horse when racing, Bushire, Persian Gulf

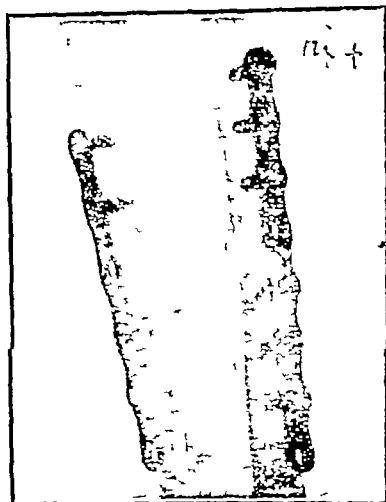


Fig 4—Capt O Fracture of both bones of forearm
Taken six months after operation

After unsuccessful attempts at reduction by manipulation the case was sent to me for operation accurate restoration of the fragments, on the 8th February, 1919 The patient went to India on the 28th February, 1919 He wrote to me on 1st November 1921, three and a half years after the operation, "I can play tennis almost as well as I could before I broke my arm, I have not had the plates removed as they never give me any trouble"

Lady W, Simla 7th November, 1921 (Fig 5) Badly comminuted fracture of lower end of tibia and fibula by direct violence Pony

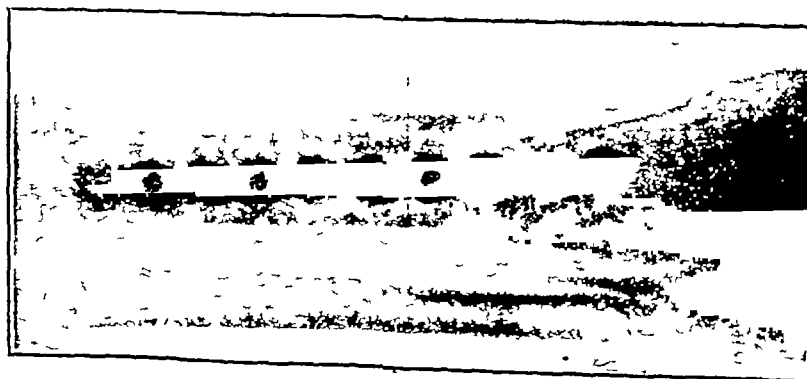


Fig 5—Lady W 26th October, 1921 Fracture of both bones of leg Direct violence

fell and crushed the ankle against a rock, very difficult case Began to walk on the 12th February, 1922 can now walk 10 miles without fatigue, plays badminton

J S I P, aged 53 (Figs 6a and 6b) Fracture of distal end of fifth metacarpal bone



Fig 6a—T S, Poona, November 1917 Fracture of head of 5th metatarsal



Fig 6b—T S, Poona, November 1917 Fracture of head of 5th metatarsal

Radiogram speaks for itself complete restoration of function

A S, Simla, 1922, aged 10 Fracture of neck of the femur by direct violence Fall of 19 feet Fracture exposed and fragments fixed Perfect anatomical and function result

SOME OBSERVATIONS ON DYSENTERY

By J CUNNINGHAM, B A, M D,

MAJOR, I M S

Director, King Institute of Preventive Medicine,
Madras*

I MUST first express the honour I feel at having been asked by your Director to give an address in this School. I must next ask you to bear with me if at times I am unable to bring forward figures in support of certain statements which I may make during the course of my lecture. I only received the invitation to address you while on my way through Calcutta nine days ago to attend the Science Congress at Lucknow. I have thus had little or no opportunity to prepare a discourse. Neither have I been able to refer to my notes which are for the most part in Madras. I must thus rely upon my memory for many of my facts,† and, as you know, memory is only too apt to play one false in this country.

The subject upon which I wish to speak to you is dysentery. Dysentery, as you all know, is merely a clinical term given to a certain syndrome which originates from a variety of different causes.

The term, as usually applied however, refers to the effects of an invasion of the lower intestine with one or other of two very definite pathogenic organisms—*Entamoeba histolytica* and the dysentery group bacilli. I do not propose to consider any of the other types of dysentery.

It would be quite impossible in the time at my disposal to give you an exhaustive survey even of these two types of the disease, nor do I believe that you would derive much benefit if I attempted to do so. I intend to refer to certain aspects of the disease alone and, in doing so, to bring to your notice some of the points which have impressed themselves upon me during the time I have been interested in this subject.

When I first commenced to study this disease in 1912 it was generally considered that two types of dysentery existed in this country—

(1) Jail or institutional dysentery which was due to a bacillary cause and had a special epidemiology of its own, and

(2) The dysentery found in the civil population which varied considerably in severity and was considered to be most commonly amoebic in origin.

This view was widely held even as late as the earlier part of the great war, for we were told that the majority of cases of dysentery at the commencement of the Gallipoli and Egyptian campaigns were of the amoebic type until more exact investigation proved this supposition to be wrong.

It is interesting and important to consider how such a view gained universal credence. I believe

the true reason lies in the fact that the investigators of that time argued from statistics derived from two very different sources, the jail hospital and the civil hospital. In a jail, where the population is under strict control and where the means of livelihood of the members does not depend upon the amount of work they do, every case of dysentery, however mild, comes to the notice of the medical officer.

In the civil population, however, conditions are different. Days off work due to illness mean loss of pay and perhaps of livelihood. The milder cases of the disease often do not go sick at all, or, if they do, treat themselves in their own homes. It is only the more severe and chronic cases which find their way to the civil hospital. From the patient's point of view an amoebic infection is undoubtedly a more formidable complaint than the usual mild subacute attack of bacillary dysentery. It follows therefore that the hospital records tend to show an excess of such cases in their statistics, and they are thus not dealing with a random sample of the population but with a certain selected type of case.

The jail population, on the other hand, may be considered a true random sample of a certain range of the Indian community living under much better sanitary conditions than they have been accustomed to. The type of dysentery prevalent amongst them therefore, unless it be definitely of the nature of an epidemic, must necessarily be an expression of the dysentery in the general population outside the jail, and, as every case comes under the notice of the doctor, the amount and type of dysentery in a jail forms a very good index of the state of affairs in the general population outside the jail. In fact I regard the term jail dysentery used in the old sense, as a misnomer altogether. There is no such thing as a dysentery peculiar to the jails and I consider the type of disease found inside and outside the jail to be one and the same. This being the case, the true ratio of frequency between bacillary and amoebic infections in this country can best be obtained from jail statistics.

What do these show? They show that both types of the disease occur in endemic areas and that the relative frequency of the bacillary type is far greater than that of the amoebic.

In Eastern Bengal I found 86.5 per cent of my cases to be bacillary, 7.7 per cent to be amoebic and 5.7 per cent to be mixed infections showing both dysentery bacilli and amoebae. I believe I am correct in saying that Major Acton has lately found the bacillary type in 85 per cent of the cases investigated by him here, so our figures almost coincide for this part of the country.

In the Madras Presidency, where we at the King Institute have had the opportunity of examining a large number of prisoners taken during the late Moplah rebellion, the same ratio holds good, although the percentage of amoebic

* Being an address delivered at the Calcutta School of Tropical Medicine.

† The figures have been verified before publication.

SOME OBSERVATIONS ON DYSENTERY

By MAJOR J CUNNINGHAM, B A., M D., I.M.S.
Director, King Institute of Preventive Medicine, Madras

CHART

A series of 40 cases illustrating the liability to recurrences in Jail dysentery—

Series A Shows cases in which all the attacks were dysenteric.

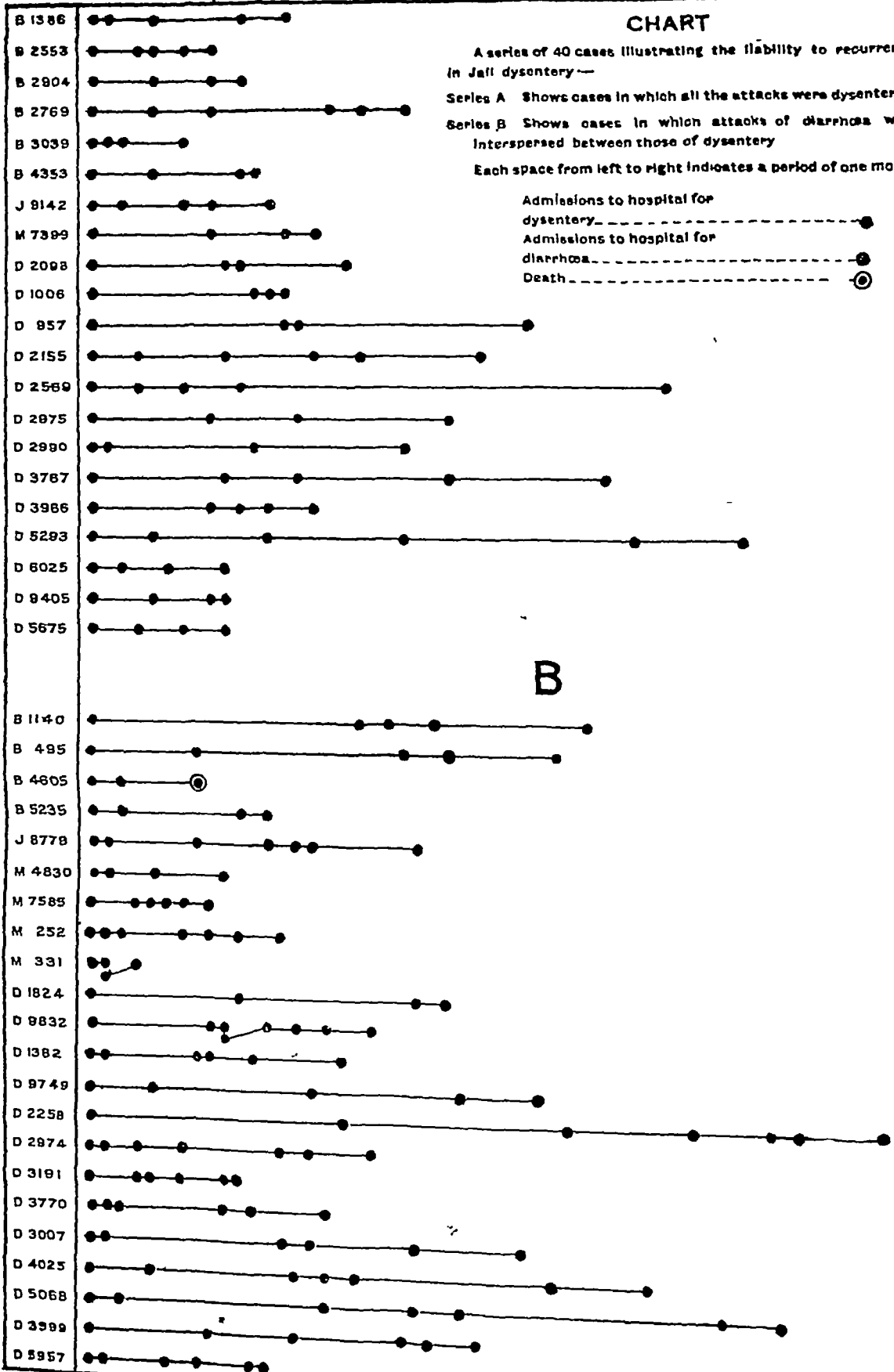
Series B Shows cases in which attacks of diarrhoea were interspersed between those of dysentery

Each space from left to right indicates a period of one month.

Admissions to hospital for
dysentery—

Admissions to hospital for
diarrhoea—

Death—



amount of weight. This loss, however, is usually made good as soon as the dysenteric symptoms subside.

Subacute cases of the type I am describing, show a great tendency to relapse and to continue to relapse. Such relapses may be either in the form of attacks of simple diarrhoea or further subacute attacks. A reference to the chart which I hand round, and which is taken from one of our papers in the *Indian Journal of Medical Research*, illustrates this point very well. Complete cure cannot be claimed until the original weight has been regained and the patient has been shown to be free from any symptoms of "latent dysentery", a term which I will explain more fully later on.

The symptoms of subacute dysentery tend to disappear of themselves if left alone. I proved this very conclusively by treating a series of unselected cases of this sort in rotation with various drugs which included magnesium sulphate, grey powder, calomel and injections of emetine. The series was controlled by a number of cases which received no medicinal treatment whatsoever. The period the symptoms were present, the length of stay in hospital and other similar observations were compared in each group and it was found that the general results in the control series were in no way inferior to the other groups. The laxative treatment, particularly with magnesium sulphate, shortened the period of the acute symptoms to a slight extent, and was therefore beneficial.

Emetine, as might be expected in such cases, the majority of which were of a bacillary nature, had no effect one way or the other. The cases treated with this drug got better in the same time as those of the control series. The fact that such cases tend to improve of themselves shows that it is unjustifiable to use emetine as a means of diagnosis between amœbic and bacillary infections. Improvement under treatment with emetine should never be used as a substitute for the proper examination of the stools in any case of dysentery, however mild.

A very useful adjunct to the ordinary methods of diagnosis, especially in cases showing few or no symptoms (latent cases) is a proctoscopic or sigmoidoscopic examination. Major Munro, I.M.S., and myself examined a series of cases in this way early in 1914 and found that direct inspection and culture of the ulcerated surface gave information of great value. The method came into prominence during the war and is now strenuously advocated by Manson Bahr and others.

You are all aware of the various complications which may arise during the course of an attack of subacute dysentery. Certain of these are of special interest—

Arthritis, which may affect one or more joints, is said to be a common complication after certain epidemics. The condition consists of an effusion into the joint which does not go on to suppuration. Manson Bahr mentions it as frequently seen in convalescent dysentery cases from the Gallipoli,

Egyptian and Balkan war areas. I do not think this condition can be a common one in India. I have never seen a case of true arthritis with effusion following dysentery, although patients have complained of rheumatic pains coincident with or following the disease.

Rogers also states that he has not met with the condition.

Post-dysenteric neuritis is a more definite complication. These cases undoubtedly do occur, and it is not strange that this should be so, when we remember the powerful action of the dysenteric toxin on the nervous system of the lower animals. Two cases which came under my own observation illustrate this condition very well.

In the first case the patient, who had just recovered from an attack of subacute dysentery of no particular severity, suddenly developed severe neuralgic pain down the right arm accompanied by hyper-æsthesia over the affected area. No adequate cause except the attack of dysentery could be found to account for the condition. The patient's serum reacted in a high dilution to the organisms of the dysentery group. The attack lasted for several days and then gradually subsided.

The second case, which was even more definite, showed a paralysis of the external popliteal nerve. The patient was a sepoy in whose regiment a localised epidemic of bacillary dysentery was occurring at the time. He himself had suffered from a moderately severe attack of dysentery, the acute symptoms of which had lasted for five days. Some days later it was noted that he had foot-drop and loss of power in the left foot. On being questioned he acknowledged that he had noticed numbness on the outside of the leg several days previously and that the weakness had come on subsequently. Examination showed that, in addition to the foot-drop, extension of the foot and, to some extent, adduction was impossible, epicritic sensation was lost over the whole of the anterior and outer side of the leg and also over the dorsal surface of the foot. Protopathic sensation was absent over a smaller area. The knee and ankle jerks were present. The connection between the paralysis and the dysentery was undoubted, for no other cause for the sudden onset of a condition of this sort could be discovered.

Another complication of considerable importance is a condition which has usually been described as a hepatic cirrhosis *with ascites*.

That this disease is connected with antecedent attacks of dysentery appears to be an undoubted fact, but opinion is divided as to the true origin of the symptoms. The cases which I saw undoubtedly showed advanced fibrotic changes in the liver and other organs. I was therefore led to the belief that the liver was the primary cause of the affection. Your Principal, Colonel Megaw, on the other hand, considers that the peritoneum is primarily at fault, and holds that the ascites is due to a chronic inflammatory change occurring

chiefly in the region of the upper abdomen Rogers, some time previous to my observations considered the condition to be a cirrhosis of the liver Whatever the true pathology of the condition may be, the disease itself is of considerable importance on account of its relative frequency and its almost invariably fatal result

I now pass on to *chronic dysentery* This stage of the disease was not associated with dysentery by the older physicians in this country Norman Chevers described it under the name of *Morbus Bengalensis* Mr J Taylor in 1826 gave it as his opinion that "Three-quarters of the total deaths amongst the lower orders of natives in Hindustan are due to diarrhoea the malady occurring idiopathically or as a terminating symptom" This type of case is usually found amongst the older type of Indian patient but is also to be found in comparatively young subjects It would appear as if the protective mechanism of the patient becomes gradually worn out by repeated attacks of the disease Each attack leaves him less able to cope with the next They appear at ever shortening intervals until finally he becomes a permanent habitue of the hospital Gradual and progressive loss of weight, in spite of all treatment, is a most important sign that the patient is passing into this stage of the disease.

Advanced cases of this type are easily recognised They are usually very emaciated in the later stages, being literally nothing but skin and bone The skin is tightly drawn over the face The eyes are sunken and the eyelids half closed The mouth remains open, the tongue is dry and coated and the patient lies too apathetic and weak to brush away the flies which gather at the angles of the mouth and eyelids The patient finally becomes semiconscious, taking no notice of surrounding objects, and passes urine and faeces under him The degree to which the weight can be reduced before death supervenes is extraordinary In one case which came under my notice the patient, an adult Indian male, weighed only 58 lbs on the last occasion on which he was weighed before he died The stools passed by such a case are never excessive and vary considerably in character They are usually copious and may be simply diarrhoeic or semisolid containing particles of undigested food Mucus or mucus and blood may be altogether absent for long periods and when present appear in the faecal matter in veins or streaks like marble

These chronic cases appear to terminate in one of two ways In the first they linger on, becoming gradually more emaciated until they die of sheer inanition In the second, a case of the first type may develop local or general oedema The oedema may commence in the lower extremities and may become general extending to the face and body The oedema in such cases does not appear to be cardiac in origin but is much more akin to that seen in renal cases or in beriberi This ob-

servation is borne out by the fact that the physical signs of a failing heart are absent when the oedema appears Further, the oedema itself is much more firm and is not confined to the dependant parts of the body The jail hospital records confirm this observation for instances were found where a case of dysentery had been discharged as such and readmitted as a case of beriberi Murmurs may be heard in the cardiac area but more often nothing abnormal is noted Sudden precordial pain is sometimes observed and as a rule is a symptom of bad omen for death generally follows in a few hours

The clinical picture suggests that these cases are suffering from the effects of a deficiency of some substance essential to the well being of the body This deficiency is probably due to an interference with the normal metabolism of the body brought about by the action on the vital organs of some form of toxin, either specific or non-specific, absorbed from the diseased colon The chronic interstitial changes found in various organs and the cirrhotic condition of the liver already referred to support this view of the pathology of the condition

The post-mortem appearances of the large intestine in these cases are very typical The amount of actual ulceration found varies very considerably Time does not however permit of my giving a detailed account of the morbid anatomy of this very interesting condition

I wish to speak now of another type of dysentery which is of the utmost importance from the point of view of the prevention and control of the disease I refer to the condition to which I have given the name "latent dysentery" I have already mentioned the liability of the subacute case to relapse During the intervals between the attacks the patient, as a rule appears to be free from the disease and pursues his vocation in life as a normal individual In many instances this is far from being the truth, however, for careful examination of the stools at this time will reveal signs of the disease so long as the patient has not been completely cured The proof that such cases exist lies in the fact that, if a systematic macroscopic examination of the stools of any community in an endemic area is undertaken, a certain percentage of the so called normal population will be found to be passing varying quantities of mucus or mucus and blood in addition to, and even in place of, their normal motions The actual number of these latent cases will vary according to the intensity of the infection in the district The percentage of such cases present can therefore be used as a dysentery index, somewhat similar to the spleen index in malaria

To illustrate these points let me give you some figures which I obtained during my investigation of this subject in the jails in Bengal The stools of 3,460 individuals in the normal populations of four jails were subjected to a single macroscopic examination 411 of these or 11.88 per cent were found to be abnormal in that they contained

a varying quantity of mucus or mucus and blood. The percentage of abnormals found in each individual jail varied between 10.38 and 24.56. Further investigation showed (see tables) that a single inspection was not sufficient to detect all the abnormals present as the passage of mucus in these cases was found to be intermittent.

By repeated examination of the stools for 10 successive days the percentage of abnormals was raised to 22.8 and it was found that eight examinations were required to detect all such cases present in the population.

TABLE I

Showing the increase in the proportion of latent dysentery found in a population by increasing the number of inspections

Number of examinations	Observed			Calculated	
	Appar-ent normals	Abnor-mals	% of ab normal at each exami nation	Appar-ent normals	Abnor-mals
1	32	3	8.57	32	8
2	14	3	17.64	15	2
3	32	5	13.51	31	6
4	92	16	14.81	88	20
5	29	9	23.68	30	8
6	14	10	41.66	19	5
7	9	5	35.75	11	3
8	30	7	18.91	29	8
9	51	13	20.31	50	14
10	81	24	22.85	81	24
Total	384	95		386	93

TABLE II

Showing the amount of latent dysentery found at each examination in a series of 10 inspections

The population is the same as that in the previous table

No of examinations	No examined	Abnor-mals found	Per cent of total abnormals found at each examination	Percentage of abnormals (per population) found at each examination	
				Observed	Calculated
1st	479	37	38.9	7.7	8.37
2nd	444	28	29.5	6.3	6.33
3rd	437	13	13.7	3.0	3.39
4th	390	7	7.4	1.8	2.16
5th	282	3	3.2	1.1	1.38
6th	244	2	2.1	0.8	0.88
7th	220	4	4.2	1.8	0.55
8th	206	1	1.0	0.5	0.36
9th	169				0.23
10th	105				0.14
TOTAL	479	95	100.0	23	22.79

The figures which I have just given you were subjected to statistical scrutiny by Lt-Col McKendrick, I.M.S., who calculated the theoretical

value of the corresponding figures on the supposition that the population comprised two distinct classes, normals and abnormals. The values calculated by him are given in the right hand columns of the tables which I have shown you, and it will be seen that they correspond very closely with the figures obtained by actual observation. Colonel McKendrick from his examination of my figures was thus able to draw a very similar series of conclusions to those which I have just given you.

The proof that these cases of latent dysentery were actually cases of dysentery in a latent stage rests upon the following evidence—

(a) They showed signs of a diseased colon by the presence of mucus or mucus and blood in their stools.

(b) Proctoscopic examination of 20 cases showed the actual presence of ulcers in the rectum in 10, or 50 per cent, whilst mucus and blood were found on the instrument after withdrawal in a further six cases, pointing to the presence of an active inflammatory process higher up.

(c) 24 per cent of the latent dysentery cases noted passed through an acute attack of the disease while under observation, the majority of them in less than six months after detection. A large proportion of the remaining cases were under observation for shorter periods than six months.

(d) Bacteriological examination of the stools in 68 individuals, undertaken while the case was in the latent stage, showed bacilli of the dysentery group, similar to those isolated from acute cases of dysentery, in 26.47 per cent.

The evidence that these cases were undoubtedly cases of dysentery in the latent stage was therefore very conclusive.

Further, when I tell you that the percentage of such cases amongst the new admissions into jail was higher (15.2 per cent as the result of a single examination) than that present in the jail population (13.5 per cent), you will understand why I consider jail dysentery to be merely an expression of the dysentery occurring in the community at large and not an etiological entity special to the jails themselves.

The detection of the latent dysentery cases in any community is of the utmost importance for two reasons.

(1) They themselves tend to increase the incidence of the disease by suffering from relapses, and

(2) by acting as "potential carriers," they may spread the infection and produce fresh infections.

We all know the very limited application of bacteriological methods to the detection of "carriers" in any infective disease. The time and labour involved, to say nothing of the expense, generally rule the bacteriologist out of court except under special circumstances where the health of a definite community, such as the army, makes the investigation worth while.

This is especially the case with dysentery, for the healthy carriers in the amoebic type are so numerous that the isolation of all such cases has been shown to be impracticable and attention can only be given to those actually showing signs of the disease. In the bacillary form of the disease too the search for the specific organisms is so difficult and uncertain that it can hardly be considered a practical measure. A simple and practical method for the detection of the carrier case which is likely to be a danger to the community is therefore a very great necessity.

I am convinced that we have in the method which I advocate, that is the systematic *macroscopic* examination of the stools, a really practical means of dealing with the carrier problem as far as dysentery is concerned. By this means I maintain that the vast majority of the latent, and therefore dangerous cases, can be separated from the healthy population in any community which is sufficiently under control to permit of a daily examination of their stools. Large numbers of cases can be examined in a comparatively short time and the technique does not call for any special skill on the part of the medical attendant.

The advantages of such a division into normals and abnormals in a population of this sort is twofold.

(1) The abnormals are detected and can be treated with advantage to themselves and also to the community at large, for the incidence of the disease due to relapses amongst this particular group is considerably lowered.

(2) The isolation of the latent cases who are the potential carriers prevents the disease from spreading amongst the normal population.

I may say that this method of controlling the spread of dysentery has already passed beyond the realms of theory. It has now been tested on a large scale on several occasions with the most satisfactory results. Time does not permit my entering into the details of these tests, nor am I at liberty to do so at present. It may interest you, however, to hear some of the more important facts dealing with one of these large scale trials.

The community dealt with in this particular instance was a very sickly one with a high dysentery rate. The systematic examination of the stools of the whole community was undertaken. The stools of each individual were inspected on 12 occasions. The latent dysentery index was found to be 30.9 per cent. The normals and the abnormals were separated from each other and the latter received appropriate treatment. The incidence of dysentery in the community as a whole fell rapidly as the result of these measures. The subsequent dysentery rate from each group was noted, and it was found that 97 per cent of the cases came from amongst the latent dysentery

group, while only 3 per cent were derived from the presumably normal population. These figures show conclusively that the methods adopted in the selection of the abnormal group had been successful in detecting the majority of the future cases of dysentery in that particular community.

I would strongly recommend those of you who may in the future be placed in charge of large aggregations of people to adopt this particular method of dealing with the problem, should you be faced with a rapidly rising dysentery rate which does not appear to yield at once to the usual sanitary measures.

Although I have dealt with the *macroscopic* examination of the stools of the dysenteric mainly from the point of view of public health, I am convinced that the method is applicable to the private case also, and should assist the physician in deciding when his patient has been completely cured of the disease.

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THE CAUSATION OF ASTHMA AND ITS TREATMENT

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THE word asthma has been loosely used to describe a condition of the lungs associated with spasm of the bronchial muscles and turgescence of the mucous membrane. During the last few years the various types, such as the pollen, bronchial, food, and animal asthmas have been separated one from the other.

The term merely expresses a symptom-complex, and is just as vague as the diagnosis of dropsy, jaundice or dysentery. The ætiology of the disease has been obscured, in spite of the separation into distinct types, by writers not recognising the relative value of the part played in individual cases by inheritance, sensitiveness, and individual peculiarity.

The study of anaphylaxia, and its production by proteid injections has tempted many to draw an analogy between anaphylaxia and asthma, and has resulted in the wholesale treatment of asthma by injections of peptones. K. K. Koesler (1920) in a paper on the pathogenesis of bronchial asthma, considered that this symptom-complex was due to an amniosis (amine intoxication)

Sir Leonard Rogers pointed out in 1916 that asthma is very prevalent in Bengal, and reported favourable results by treating his cases with injections of streptococcal vaccines. For the last two years one of us (H W A) has been particularly interested in this disease from the clinical side, and first treated cases with bacterial vaccines; many responded and have been cured, but with others vaccines caused no amelioration of the spasms. With experience we gradually began to recognise the frequency of the different causative factors.

Two very typical cases came to us. The first was a man who lived in the mofussil and invariably got asthma there, but was free from the disease in Calcutta. This case was found to be one of horse asthma. The other was a lady who kept a number of cats in her house. The removal of the causes cured these two cases and they have remained free for over a year.

Lately we have been working at the various bases associated with dysentery, cholera and rice, and found that some of these bases were volatile and some non-volatile. It was obvious that these two cases of animal asthma could not be attributed to peptone shock, but were due rather to some volatile poisonous bases, viz, ammonias, amines or imines, which were formed during the decomposition of the urine, etc, of these animals. Further one of us (H W A), working under Dr H H Dale, F.R.S., during 1919-20, realised the far reaching effect of his work on the amines produced in rye by *Claviceps purpurea* (Ergot).

The production of bronchial spasm or relaxation is best seen when these bases (amines), e.g., histamine or epinephrin, are injected into the blood stream. The profound effect on the bronchial musculature, which can be thrown into sufficiently strong contraction to kill a guinea-pig from asphyxia with distended lungs and a fall of body temperature similar to a fatal anaphylaxia, can be demonstrated in the laboratory by injecting 5 mgms into this animal. Another point of similarity is the severe local urticaria seen when a solution of 1-1,000 of histamine is placed on the scarified skin (Eppinger and Guttman, 1913). The same occurs in asthmatic patients, who are sensitive to certain water-soluble products derived from animal hairs and food. Dale and Laidlaw (1917) showed that histamine behaves differently when injected into rabbits and guinea-pigs, thus in guinea-pigs it killed by producing bronchial

spasm, but in rabbits by obstructing the pulmonary circulation. In the cat, doses of 1 mgm and upwards produce a condition resembling traumatic shock, there being oligæmia from the passage of plasma out of the vessels, and retardation of the blood in the peripheral capillaries owing to loss of tone. On the other hand, histamine does not produce the profound alteration in the coagulability of the blood which is characteristic of anaphylaxia and peptone shock. Again recently Dale (1921) has shown that histamine varied a great deal in its effect on the uterus of the particular guinea-pig chosen, thus the uterus of a healthy virgin guinea-pig of 250 grms gave the most constant results. Multiparous and pregnant uteri of these animals were very erratic in their behaviour. This shows the difference in the toxic reactions against this poison —

- (1) As regards the age of the guinea-pig
- (2) As regards the alteration in the tissues by a previous or impending pregnancy

In a paper read by us before the Indian Science Congress, 1922, we pointed out that some of these bases (amines) functionate best as ampholytes, i.e. at a pH of 7.0 similar to that of the pulmonary arterial blood, where the pH approaches neutrality, and the CO_2 tension is the lowest in the body. This experimental fact probably explains the selective action of these bases for the pulmonary area. Many of these bases act on involuntary muscle, either directly, or through the sympathetic nerve endings, and at the same time increase the capillary permeability of the finer vessels, leading to turgescence of the mucous membrane of the bronchioles.

We have seen this effect experimentally on the cat when testing the action of these various amines. The lung becomes full of bubbling râles and the secretion in the trachea is then frothy and often blood-tinged. In other words we have been able to produce the symptom-complex called asthma by injections of these bases.

The causation of asthma can be best considered under three distinct headings —

- (a) Poisonous bases that cause constriction of the bronchial muscles and turgescence of the mucous membrane
- (b) The defensive mechanism of the body against these bases,
- (c) The tonus of the nerves that receive the stimulus of the poison

(a) *The Poisonous Bases that cause Asthma*
The extrinsic causes of asthma are usually considered under two headings

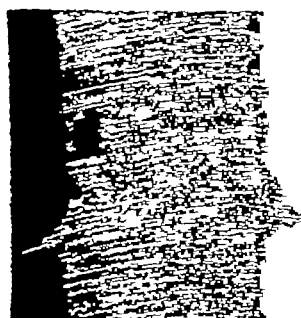
- (1) *Emanations* from various animals, the commonest is the horse, then the dog, cat, feathers of fowls, geese, more rarely parrots, canaries, and other birds that are kept as pets

THE CAUSATION OF ASTHMA AND ITS TREATMENT

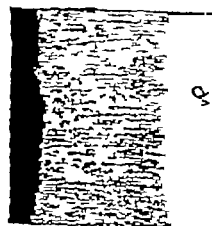
By MAJOR H W ACTON, I M S and R N CHOPRA, I M S,

PLATE I

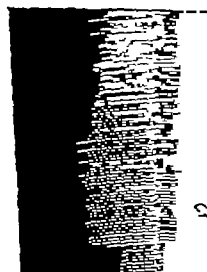
A few minutes (NH_4Cl) causing constriction of the bronchial muscles,



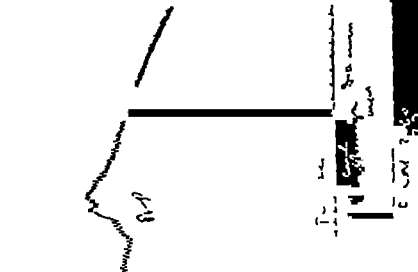
Respirations



Blood Pressure



12



Time—six secs



Fig 1—Hordenine, albetane obtained from barley

Fig 2—Paraphenylenediamine, a dye causing asthma in m

Fig 3—Cnidaverine, an amine obtained during putrefaction

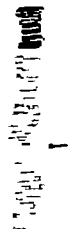
Fig 4—Dose 0.5 mgms. areco line, the alkaloid from 'areca nut', or sipari —Note the bronchial spasm

PLATE II.

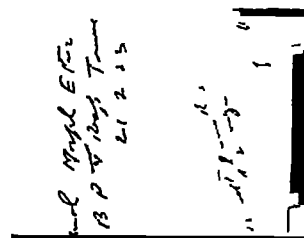
The amines causing relaxation of the bronchial muscle



Respirations



Blood Pressure



Time—six secs

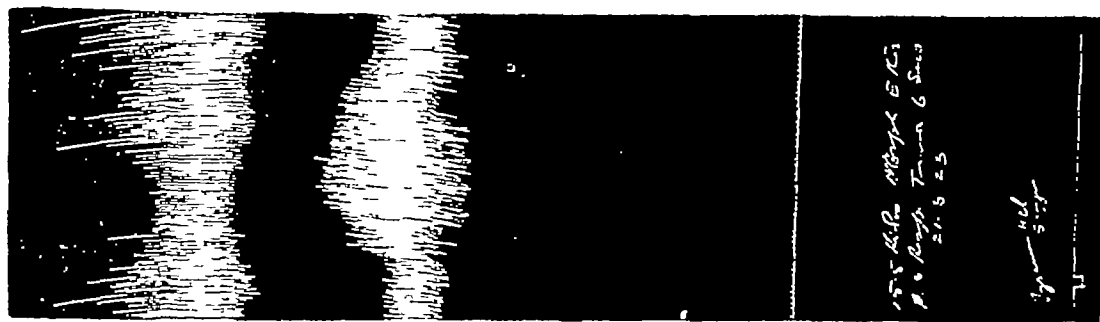


Fig 5—Trimethylamine base, 20 mgms

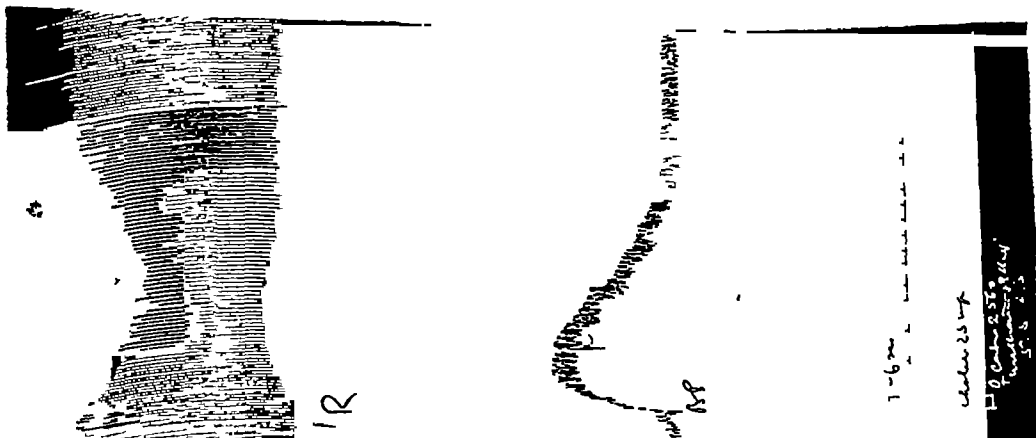


Fig 7—Cholin, 25 mgms

Woodhouse has shown that the cat poison is soluble in water and in alcohol and is therefore not a proteid. We are of the opinion that this class of asthma is caused by volatile bases. In India barbers are, as a rule, affected more than are most other professions, possibly owing to their practice of shaving the axillæ, etc., of their clients.

(2) *Various pollens*—Longscope (1921) found that hay fever of the autumn is due to rag weed, *Ambrosia artemisiifolia* and in the spring to various grasses, e.g., Timothy grass, *Phleum pratense*, red top, *Agrastea alba*, and June grass, *Poa pratensis*. In India the only cases we have seen have been due to the pollen of the deodar.

More work is required to see whether these poisons are volatile or non-volatile bases.

Of the *intrinsic* causes commonly seen in India, the majority of our cases are due to—

(1) *Respiratory infection*—These cases come on later in life and are associated with chronic bronchitis and emphysema. The attacks occur during the winter months and are closely correlated with damp weather. The common organisms that have been incriminated are streptococci (Rogers), staphylococcus, B. Friedlander, and we also employ in our vaccines a *Leuconostoc* that grows well on whey agar.

In these cases the effect may be produced in two ways, by reflex irritation of the vagus through ulceration and turgescence of the mucous membrane, or through the sympathetic by the formation of poisonous bases. That such bases are formed is confirmed by the occurrence of Charcot-Leyden crystals in the sputum, which are similar to the crystals found in prostatic fluid and chemically considered to be ethylene-imine.

(2) *Intestinal origin*—Many of these cases come on early in life and often show a hereditary tendency, this point has been fully dealt with by Atkinson (1920). Sometimes they are associated with occupation, e.g., bakers sensitive to rye or wheat, chemists to ipecacuanha, etc. The commonest food stuffs that are responsible for this symptom-complex are the carbohydrate foods, wheat, maize, rice in Bengal, rye and barley. Potatoes are a fairly common cause, and the animal proteids such as eggs, milk, fish (especially lobsters and oysters), salmon, mackerel, cod and haddock, lastly beef and chicken. These cases can only be diagnosed by keeping a careful diet chart, and eliminating the commoner articles in turn, thus one stops bread and eggs, then rice and milk, etc., until the particular food is found that causes the spasm. This group is not associated with seasonal incidence or with changes of residence, as are the bronchial and animal asthma cases.

Intestinal derangements—A few of our cases have been suffering from *E. histolytica* infection,

in them the bacterial flora of the stool is often altered, the number of lactose fermentors is diminished, and the plate cultures show yeasts, streptococci, etc. We can quote two such cases from our experience, where emetine alone has cured the patients of asthma, owing as we believe to the healing of the ulcers, and the alteration in the bacterial flora, whereby no more poisons have been formed or absorbed and so the disease has been cured.

Most rarely of all, asthma may be caused by some bacterial infection of the uterus, bladder, or teeth.

The modern view of the causation of asthma is largely bound up with the analogy drawn between anaphylaxia and proteid injections. The first point is that none of us know the chemical composition of these proteins, except that they are bases with NH_2 groups and very few have ever been isolated in a pure state, the common proteins used, e.g., Witte's peptone, are a mixture of amino acids, etc. In spite of the enormous amount of work done on anaphylaxia this phenomenon is very little understood. We are therefore arguing from an unknown into a known complex. If we start from the known, we may possibly proceed to obtain some rational idea of the chemical nature of these poisons. Geddon (1920) found that the dye paraphenylenediamine caused asthma amongst the workers who were engaged in this trade. Out of seven cases, six were men and one was a woman and they had been employed from varying periods from 3 months to 10 years.

Ürsol, another dye, also causes asthma, the mere odour of the dye was found to be sufficient to induce an attack, and the patients were cured when they gave up their occupation. Dale has already shown the intense bronchial constriction produced by histamine, we have been working at these compounds, and in Fig 1 is shown the effect of hordenine, a betaine obtained from barley, in causing bronchial constriction. Some of these amines cause bronchial contraction (Figs. 2, 3, 4), whilst others cause relaxation, e.g., epinephrin and cholin (Figs. 5, 6, 7).

These amines are derived from amino acids largely by the action of anærobic and ærobic bacteria, such changes can occur in the decomposition of the urine of many animals, and by bacterial action in the lungs and intestines of man. From these known facts we can proceed into the unknown chemistry of proteins, etc. These products act mainly through the sympathetic and cause bronchial constriction.

A second class of bodies—the alkaloids, e.g., pilocarpine, and arecoline, an alkaloid in *Areca* or *sopari* nut—cause marked bronchial constriction by their actions through the vagus. In India the excessive chewing of betel plays a part in the production of asthma in vegetative individuals. This class we also frequently

in out-patients as women who sell pan or betel leaves. We have therefore two known chemical types of bronchial constrictors —

(1) Bases formed from the disintegration of the proteid molecule, *e.g.*, amines acting through the sympathetic. These may be volatile amines, *e.g.*, trimethylamine or non-volatile, *e.g.*, hordenine and histamine.

(2) Alkaloids acting through the vagus, *e.g.*, pilocarpine and arecoline.

(b) *The Defensive Mechanism*

The defensive mechanism concerned in controlling the action of these poisons consists of —

(1) An increase in the number of leucocytes, mainly in the eosinophiles. We have met with counts of 30,000 per c.mm. and with a percentage of 90 for these cells. Knowles and Acton (1914) regarded these granules as enzyme granules which are concerned in dealing with the toxins elaborated by worms, in food poisoning with urticaria, serum sickness, and in asthma. Now we regard eosinophilia as an indication of the circulation of these poisonous NH_2 bases in the blood stream.

(2) The hydrogen ion concentration of the different organs. Lately we have been working at the pH of the different organs, and find that the liver is the most acid organ in the body with a pH of 6.2. Further, many of these amines are only active at a pH of 7.2, this explaining their direct action on the lung, where the blood is most oxygenated. In Figs 8 and 9 one can realise the importance of the liver in preventing the action of hordenine when injected through the mesenteric vein, as compared with the effect when hordenine is injected through the external jugular vein. The detoxicating function of the liver is very important in the food poisoning group where the poisons are coming directly to this organ.

(c) *Activity of the Endocrine Organs*

We will not attempt to discuss this very difficult and intricate subject, but will give our experimental findings as far as they have gone. Epinephrin is an amine and causes dilation of the bronchial muscle by its direct action on the cell protoplasm, as it can act when both the vagus and sympathetic are paralysed.

Most of the amines we have tested act through the sympathetic; thus a 1 in 100 million dilution of epinephrin can prevent the action of a 1 in 100 thousand solution of hordenine, when tested on the excised uterus of a guinea-pig (see Figs 10 and 11). Again when 0.15 mgm. of adrenalin is injected into a cat it can prevent 25 mgms. of hordenine from causing contraction of the bronchial muscles (see Fig 12). Here in this graph, there is relaxation of the bronchial muscles due to an adrenalin effect and showing that the action of hordenine has been completely antagonised.

We are now in a position to understand the phenomenon of hypersensitiveness. If the liver is functioning properly, and the action of the endocrine glands is normal, the poisons that are coming into the system are controlled by this defensive mechanism, and so appear inert. With a breakdown in the mechanism, these organic bases can exert their effects on the bronchial muscles, and so asthma is produced and an eosinophilia occurs in the blood. New foods and poisons coming into the system require immunising or tolerance responses on the part of the child. Children often have a great reluctance to certain foods, milk, eggs, meat, etc., but most of them assimilate these foods automatically, and so acquire an immunity. Some have a congenital or an acquired immunity but sometimes a reluctance occurs against these foods with improper digestion, and they develop sensitiveness. One of us (H. W. A.) acquired a reluctance against tinned sardines during youth and has never been able to eat this fish, however much it has been disguised, without suffering from vomiting and collapse.

(d) *The Tonus of the Nerves that receive the Poison*

Morphological and physiological studies show that the true sympathetic on one side and the para-sympathetic on the other have a remarkable antagonism against each other, it is owing to this antagonism that there results a state of equilibrium or tone. We are now in a position to show that in both the vagus and sympathetic there exists two sets of fibres, accelerators and inhibitors. It was usually considered that the accelerator or constrictor fibres were in the vagus and the inhibitory fibres in the sympathetic. Hordenine acts through the sympathetic, and if we paralyse the vagus by atropine, we still get contractions, see Fig 14. This shows that accelerator fibres are in the sympathetic as well as inhibitors. Conversely if we paralyse the sympathetic with ergotoxin, hordenine does not cause contraction, although the accelerator fibres of the vagus are still intact (Fig 13). Therefore tone or equilibrium is maintained firstly by the protoplasm of the cell, the most primitive tone, then by an individual tone of the sympathetic and vagus. In this way an elaborate system of balance is kept up which it is not easy to upset except in disease. Variations in tone may occur in either of the two systems, as a hypo- or as a hyper-activity. Bauer has observed that normally during sleep there is a physiological vagotonia. This hyper-activity of the vagus is shown by contraction of the pupils, slowing of the pulse, and a tendency to perspire, etc. This fact partly explains why labour pains and asthmatic attacks usually occur during the night. Another explanation is that during sleep the

PLATE III

To illustrate the defensive mechanisms in the body against those poisonous bites

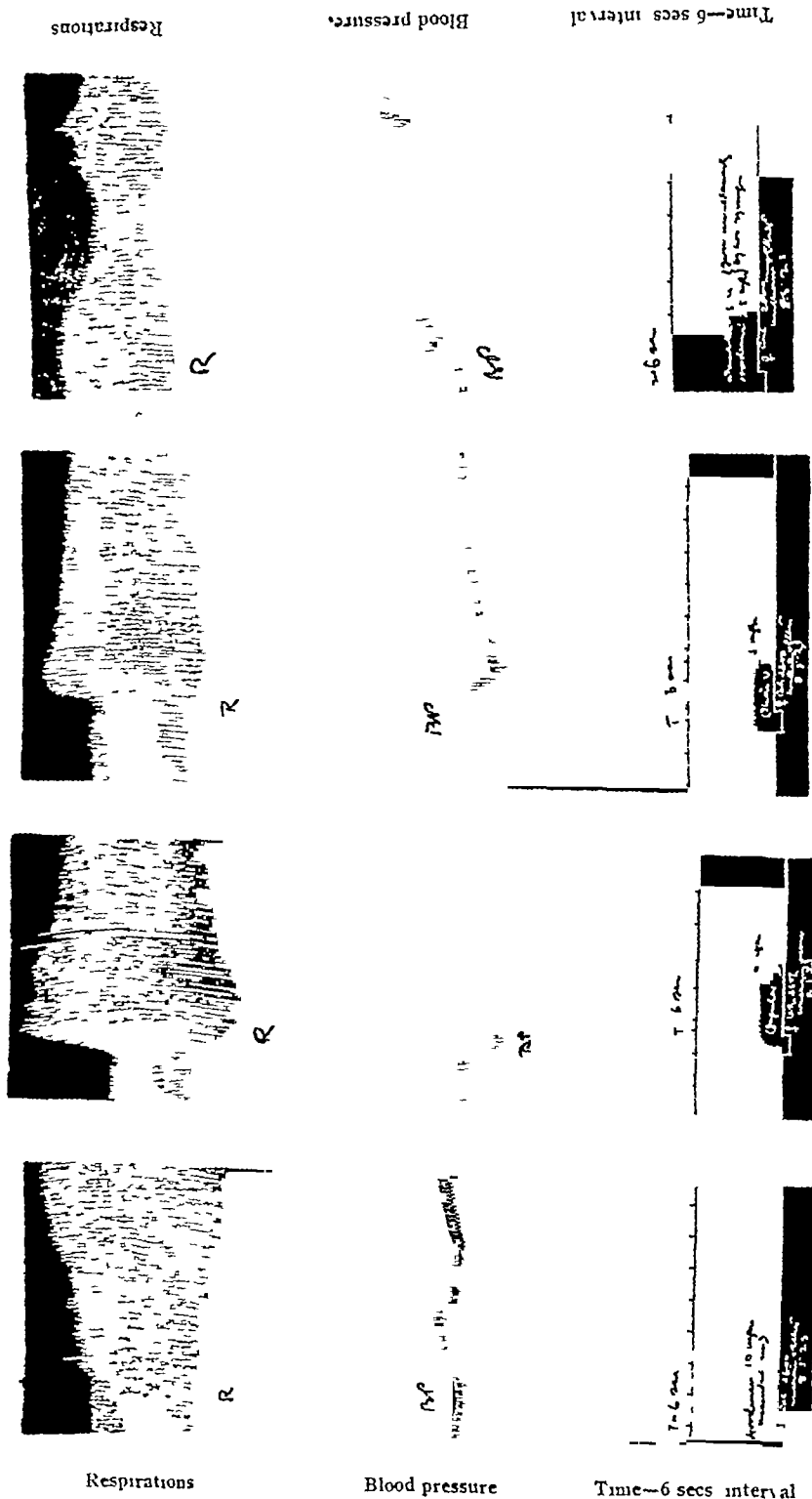


Fig 8—Hordenine injected into the mesenteric vein
 Fig 9—Hordenine, 10 mgms injected into the external jugular vein
 Fig 10—Hordenine, 2.5 mgms injected into iliac vein
 Fig 11—Hordenine, 2.5 mgms, injected simultaneously with 0.15 mgms of Epinephrine into iliac vein
 To illustrate the defensive action of the liver against these poisons (Epinephrine) from the adrenal gland

PLATE III.—(contd)

muscle pty when
doses increase
6 4 2 1

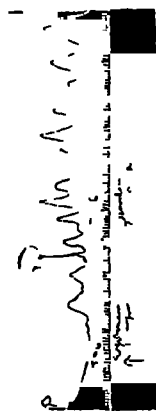


Fig 13 —Ergotoxin paralyses the sympathetic and Hordenine cannot then act

muscle pty when
doses increase
3 2 1
5 2 3

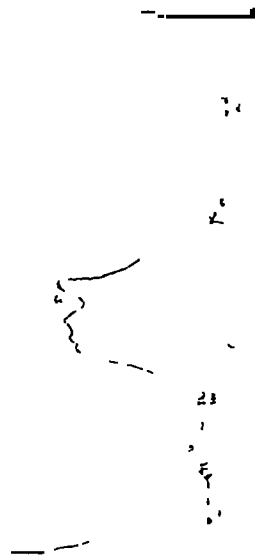


Fig 12 —The Epinephrin defence mechanism

muscle pty when
doses increase
3 2 1
5 2 3

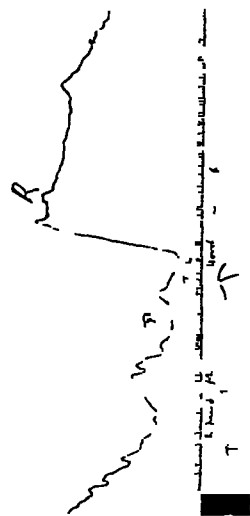


Fig 14 —Atropine paralyses the para-sympathetic, but Hordenine acts through the sympathetic

waste products are not eliminated by the urine and faeces, and moreover after the main evening meal the amino acids of digestion only reach the large intestine 4 to 6 hours later, where they are further broken down by the bacteria into poisonous bases, these two factors probably account for the attacks which occur about two o'clock in the morning

Asthma may also be caused by irritation of the vagus, *eg*, by enlargement of the bronchial glands or in aortitis. During these attacks definite symptoms of vagotonia are present, increased secretions, slowing of the pulse, and dermatographia. Eppinger and Hess a few years ago showed that one could determine which of these two systems predominated by means of certain pharmacological tests. Pilocarpine stimulates the vagus, and in vagotonics as small an amount as 1/20th grain will cause salivation, sweating, and increased peristalsis, whilst a dose of 0.25 c.c. of 1 in 1,000 adrenalin will cause a fall of blood pressure, tachycardia, and polyuria in those whose sympathetic is in a state of hypertonus. This difference in susceptibility is due to differences in tone. Alexander and Paddock (1921) tested 20 of these cases of asthma and found that 17 reacted to pilocarpine, in 10 of them it actually caused an attack. The same 20 individuals were tested with epinephrin and 13 of them reacted, these cases had a low blood pressure. Amongst our asthmatic patients therefore we find three groups of patients—

(1) *Vagotonics*, principally young people. The principal signs are small pupils, low tension pulse with a tendency to bradycardia, respiratory arrhythmia, palpitations and a tendency to perspire easily. Pilocarpine nitrate produces intense symptoms in such patients, even in as small a dose as 1/20th grain. Vagotonia is due to a deficiency in the chromaffin system.

(2) *Sympathetic predominance*. These people have high tension, fairly rapid pulse, are emotional, are subject to heat waves, and show slow digestion, dermatographia, absence of sweat, goose skin. Such patients usually suffer from sea-sickness, and do not react to pilocarpine, but react violently to small doses of atropine, *eg*, 1/200th of a grain, and to adrenalin.

The majority of asthmatics belong to the mixed class of hyper-excitability of both systems. These patients are often pale, bluish easily, have hands often cyanosed, moist and cold, and becoming pale under pressure. They perspire easily, and when they undress in public red spots are liable to appear on the chest. They are generally young persons, whom we consider as nervous, and classify as neurasthenics.

These three groups will react differently to the same poisons when entering the circula-

tion. Thus in the hyper-excitable individuals attacks can be induced by suggestion, or apprehension, and moreover as they have a deficiency in epinephrin, one part of the defensive mechanism of the body is lost, whilst the hypertonus of the sympathetic makes this system more vulnerable. It is for this reason that these patients constitute about 75 per cent of our asthmatic cases.

Diagnosis

We first examine the unstained sputum for Charcot-Leyden crystals and Curschmann's spirals. These are generally seen in bacterial infections of the respiratory passages. Staining the sputum with hæmatin and eosin is important in patients over 50, as we can separate the true asthmas (from the cardiac and renal group), by the presence of eosinophile cells in the sputum.

Next a blood film is taken, and the percentage of eosinophiles present is noted. This eosinophilia we regard as a sign of poisoning by these protein bases as it is seen in other similar conditions, *eg*, urticaria, etc. The more recent the asthma, the higher the percentage, and it is generally very high indeed in the food group with faulty metabolism. The next examination is of the stool for *E. histolytica* cysts and also by plating to see if the intestinal flora is much altered. From the examination of the patient we can often readily differentiate the various groups. Thus from the history of the case we can find out if the cause is due to some volatile base, *eg*, derived from a horse, cat, etc. These cases often come on early in life, and are not seasonal but are affected by change of residence. In such cases the skin sensitization tests are useful.

The pollen group are likewise seasonal, and there is usually a sensitiveness of the conjunctival and nasal mucous membranes.

The bronchial infection group is diagnosed by the presence of emphysema, and the signs of co-existing bronchitis.

The food group can be identified better by a carefully kept diet chart than by protein sensitization tests.

A small group is left where the bronchial spasm is caused by irritation of the vagus, *eg*, nasal conditions or enlarged bronchial glands after whooping cough, measles, or infection with tuberculosis, such individuals do not show an eosinophilia. In these cases, examination of the nose and throat and a skiagraph of the lungs should help the diagnosis. These vagotonia cases as a rule can tolerate large doses of atropine, which control the attacks. Lastly one must remember that there are mixed cases, where the patients are sensitive to two or more of these protein bases.

Recently we treated a case where the patient was sensitive to cats, removal of these

animals from her house and a thorough washing of the floors relieved her asthma considerably, but she was not cured of her disease. After a good deal of puzzling to find out the cause, she herself discovered that whenever she ate fish she got an attack of asthma. Since fish has been eliminated from her diet, she has now been free from attacks for several months.

The diagnosis of the cause of these attacks does not merely consist in calling the disease asthma and supplying a bottle of mixture in the hope that it will cure the patient. What is wanted is the skill of a Sherlock Holmes to ferret out the position from where the particular protein base concerned is leaking into the circulation, to gauge the natural defensive mechanism of the body against these poisons, and the condition of the nerves that receive these stimulating or paralytic impulses. For this reason we now refuse—unless they come into hospital for proper diagnosis—to treat these cases in the out patients, where it is impossible to carry out proper and systematic examinations.

Treatment

Once the correct diagnosis has been made, whether a cure can or can not be expected can be confidentially predicted in each case. Thus in bronchial asthma vaccine therapy will rapidly bring about the cessation of attacks. But this immunity does not last for ever and much can be done to prevent subsequent attacks of bronchitis by correcting any defects of the nose or throat by surgery and by the use of nasal douches. In the animal asthma group, removal of the cause is sufficient to cure, but if this is impossible on account of the occupation of the patient, as with jockeys, one can immunise the patient with small doses of the serum of the particular animal concerned, or with extracts from its hair, etc. In the food group, eliminating the particular food from the diet, and then if necessary giving by the mouth very small doses of the proteid concerned until toleration or acclimatisation has been reached should be resorted to, or the actual proteids concerned can be injected into the tissues. If the condition is due to derangements of the large intestine, emetine, saline purges and dimol will cure these cases. In the food group milk can often be tolerated provided that it is boiled and the lactalbumen removed after cooling, likewise baked potatoes can often be eaten, but if boiled or fried may cause an attack. The pollen asthmas can be cured by injections of the particular pollen concerned. In the cases due to vagus stimulation by reflex irritation from the nose or pressure by bronchial glands, the correction of any defect of the respiratory passages or the treatment of the glandular enlargement by vaccine or tuberculin are indicated. In our Indian patients the habit of chewing pan

should also be considered, as arecoline has a very powerful effect in causing bronchial spasm by its action through the vagus.

Having arrived at the exact cause and how to get rid of it, we must not neglect the defensive mechanism of the body. Thus we know that the amine epinephrin can prevent the action of many of these bases when in sufficient concentration. Two of the most important factors that depress endocrine functions are fatigue and starvation. The beneficial effect of diet and rest is well seen in many of our hospital patients. A marked improvement occurs although the treatment in the first instance was quite wrong. In the same way arsenic acts in the food poisoning cases by increasing the general metabolism. Dr B N Ghosh noted the fact some years ago that cases of asthma with a high eosinophile count were often cured by injections of soamin.

When there are signs of pluriglandular endocrine syndrome, extracts of the glands often do good. Ascoli has recorded good results by stimulating the pituitary gland by X-ray irradiation.

Lastly we have to deal with the state of the nerves, whether the case is one due to intoxication through the sympathetic, or through the vagus by irritation, and above these we have the highest centre, the brain, from which impulses can come which can start an attack, as in the case of smelling an artificial rose inducing an attack of asthma in a patient subject to pollen asthma. In all these states of high nerve tension good food, rest and a change to a suitable climate with healthy exercises do an enormous amount of good. In cases of vagotonia, attacks can often be ward off by taking caffeine and phenazone, whilst the antispasmodic action of the belladonna group combined with benzol benzoate given with syrup of tolu, is best seen in these cases associated with irritation of the vagus.

The treatment adopted during the acute attack is too well known to need much amplification in this paper. But there are a few mistakes that are made. The dose of adrenalin given intravenously is often too large, 1 to 2 minims is sufficient, and secondly it is usually given too late. This is the only condition in which a patient can be entrusted to use a hypodermic syringe, as he is often the only person present when the attack commences, and that is the time to give adrenalin. Moreover 2 to 4 minims injected into the muscles causes no local vaso-constriction and the drug acts like a charm in the cases of the animal and food poisoning groups.

In bronchial asthmas where vagal irritation is present, an atomiser of cocaine and atropine often affords great relief. The various powders that are burnt and inhaled usually irritate, and only make the bronchitis worse in such patients.

THE "ALDEHYDE TEST" IN MALARIA

By R B LAL, MB, BS DPH, DTM & H,
(Research carried out under the Indian Research Fund Association)

GATE and Papacostas (1920) found that a large number of syphilitic sera formed a 'gel' when a few drops of commercial formalin were added to them, and advocated a test based on this reaction in preference to the more complicated Wassermann reaction. The investigations of more recent workers, however, tend to prove that this test is not so reliable as the older one.

Spackman (1921) called attention to the fact that in kala-azar solidification occurred in a few seconds.

Napier (1922)* noted a marked opacity in the serum of kala-azar cases in addition to 'gel' formation by using the same method. This reaction he standardised after Gate and Papacostas' original test for syphilis. The "aldehyde test," as it is called, appears to compare so favourably with the microscopic diagnosis of kala-azar and is so simple in technique that it may open up a wide field of enquiry and of great possibilities in the yet little known biochemical reactions of protozoal diseases.

Before, however, a new reaction gains general acceptance its specificity has to be proved, or if the disease has a local distribution, the negativity of the reaction in the case of at least all other locally prevailing diseases has to be definitely ascertained. The question arises whether the "aldehyde test" is a group reaction or a specific phenomenon for *L. donovani*. Kala-azar and malaria parasites, though widely apart biologically, are so much allied in their clinical and pathological manifestations, that the first kala-azar commission mistook the disease for chronic malaria. If, therefore, this reaction were due to pathological conditions such as enlarged spleen, or liver, or to elevated temperature or other phenomena, perhaps causing an abnormal globulin content—it might be argued that the reaction should be present in similar clinical and pathological conditions such as in malaria.

At the suggestion of Major J A Sinton, I M S, in charge of the Malaria and Quinine Enquiry, I investigated a series of cases at Lahore where the absence of kala-azar afforded a good opportunity for conducting the enquiry. All the patients were adults.

The points involved were—

(a) Whether or not Napier's reaction was ever positive in cases of malaria.

(b) Did the opacity and 'gel' formation occur, in malaria, although to a less extent, than in kala-azar, i.e., was it only a matter of degree rather than of specificity?

(c) Whether it had any relation to the size of the spleen, to the temperature, etc.

(d) Whether it had any connection with the various metabolic processes as indicated by urine analysis.

A series of preliminary experiments was conducted. Fifty cases were taken in which malarial parasites were present. Their blood was examined before the commencement of the treatment, and some urine tests were carried out at the same time.

The following methods were employed—

Method 1—As proposed by Fox and Mackie (1921) blood was taken from the patient's finger in a Wright's capsule. It was kept overnight or centrifuged after an hour or so, and a drop of clear serum was put on a clean slide, which was inverted over a watch glass containing commercial formalin. After five minutes the slide was removed from the watch glass and examined. All cases of opacity and 'gel' formation were marked positive. In the majority of negative cases it was found that the serum would not run when the slide was placed edge-wise, but would run when the surface pellicle was broken with a glass point.

Method 2—Modification of Napier (1922). Four drops of blood were run straight from the patient's finger into a small test tube containing $\frac{1}{2}$ c.c. of citrated saline solution (Formula: Sod cit 0.5 gm, Sod chlor 0.9 gm and water 100 c.c.). A drop of formalin was added. This was kept overnight at laboratory temperature and examined after 24 hours for opacity. To standardise the reading, opacity tubes, devised by Brown (1919) and used at the Central Research Institute, Kasauli, were employed. The tube matching the standard tube I was taken as + or positive, the one matching the tube next higher in series was marked ++ or markedly positive and so on, and the one showing slight opacity but less than tube 1 was put down as \pm or doubtful.

Method 3—In 13 cases the standard method employed by Gate and Papacostas and adopted by Napier, viz., addition of one drop (1/17 c.c.) of commercial formalin (30 per cent) to 1 c.c. of clear serum was used with the following modifications— $\frac{1}{2}$ c.c. of serum from blood obtained from the finger was taken and 1/34 c.c. formalin was used, and a small test tube made out of ordinary glass tubing was employed instead of a tube of $\frac{1}{2}$ inch diameter. The results were recorded after the intervals of 1 minute, 3 mins, 5 mins, 10 mins, 15 mins, $\frac{1}{2}$ hour and 24 hours.

Unfortunately the signs adopted by Napier could not be employed as it was found that opacity and 'gel' formation did not necessarily go together. This was also noted by Ganguli (1922).

* Napier 1921 and not 1922, should perhaps have preference—Vide the *Ind Med Gaz* Sept., 1921 p 338. At least the credit should be given to him of first using the reaction on a large series of cases, of distinguishing it as an "aldehyde test" differing from that of Gate and Papacostas and of standardising its technique—
EDITOR I M G

Opacity and 'gel' formation, therefore, are separately marked thus —

Opacity	+ Indicates complete opacity in 24 hours.
Ditto	± Indicates incomplete opacity in 24 hours
'Gel' formation	+ Indicates complete solidification in 24 hours
Ditto	± Indicates incomplete solidification in 24 hours

Synopsis of results —

Total number of cases (49 M T, 1 B T)	50
Total number of positive cases by Method 1	17
Total number of positive cases by Method 2	18
Number of cases in which positive results agreed by both methods	8

Relation of the reaction to temperature —

Positive cases by Method 1 with temperature, ranging from 99° F to 102° F at the time of drawing the blood	3 out of 14
Positive cases by Method 1 with normal or sub-normal temperature	14 out of 36
Positive cases by Method 2 with temperature ranging from 99° F to 102° F at the time of drawing the blood	4 out of 14
Positive cases by Method 2 with normal or sub-normal temperature	14 out of 36

Relation of the reaction to the size of the spleen

Spleen	Total No of cases examined	Method 1		Method 2	
		+	-	+	-
Not palpable	31	11	20	10	21
Palpable	7	3	4	1	6
1 finger	4	1	3	3	1
2 fingers	3	0	3	1	2
3 fingers	2	0	2	0	2
Over 3 fingers	3	2	1	3	0

Method 3—As seen in the table below not a single case of positive reaction was obtained if

judged by Napier's standard of complete solidification and dead white opacity

An attempt was made to ascertain the history of syphilis in these cases, but as it is very difficult among the class of patients dealt with to get reliable evidence on this point, much reliance cannot be placed on the syphilitic histories noted above

Although kala-azar is unknown in the Punjab, previous infection with *L. tropica* could not be excluded with absolute certainty. In no case, however, was there any obvious manifestation of that disease. It is, therefore, impossible to say how much previous infection with *L. tropica* had to do with the slight opacity noted in some of the cases

The comparison between the results obtained by Napier (1922) and Fox and Mackie (1921) with those noted above is of interest on account of their general agreement. By Method 1 Fox and Mackie got positive results in 1 out of 4 malaria cases, and in my series the figures were 17 out of 50. By Method 3, Napier did not obtain any positive reaction in his 22 malaria cases, and this was also the case with my series. He mentions, however, two cases with numerous malarial parasites actually in circulation at the time of drawing the blood in which the 'gel' formation was rapid, and distinct opalescence with greenish tinge was observed. There was only one case in the series recorded here in which very numerous parasites were found, and it gave a positive result by Method 2 but was negative by Method 1. How far it was possible to exclude in Napier's cases concomitant kala-azar is hard to say.

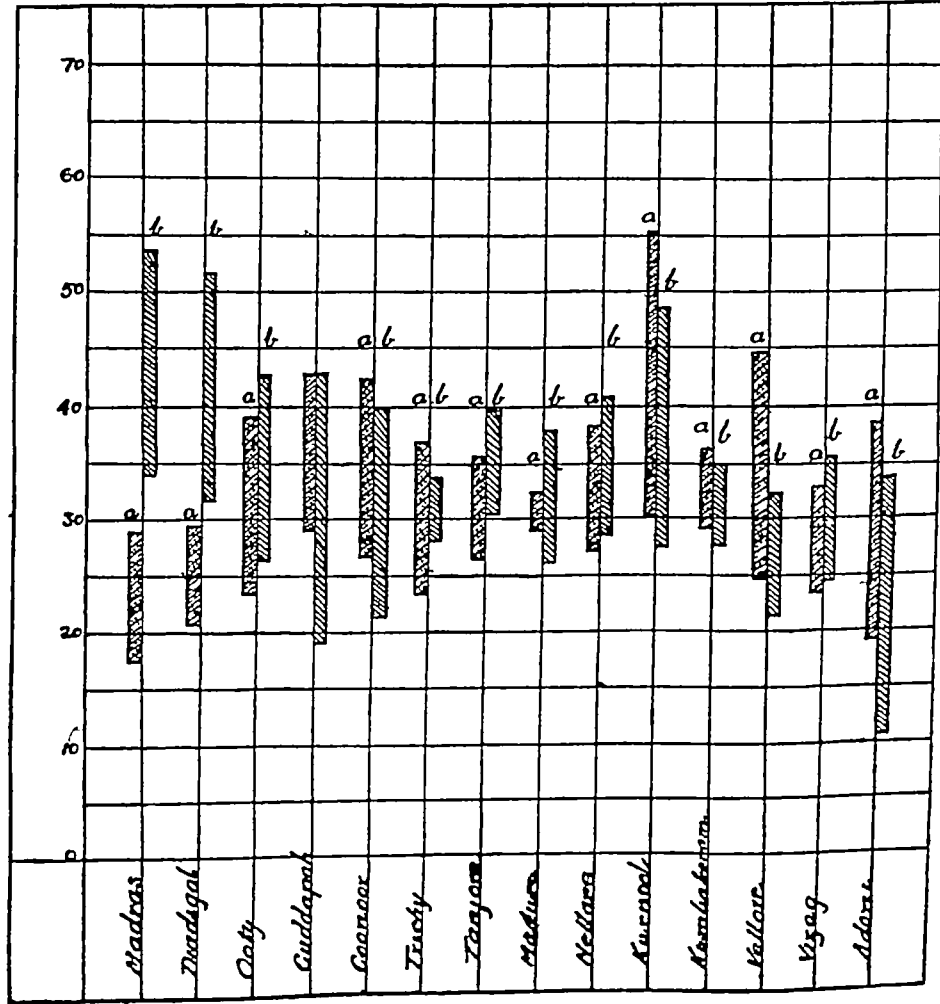
The following tests of the urine were carried out

Serial No	Parasite	Aldehyde reaction		Syphilitic History	Spleen	Liver	Temp on the day blood was drawn	Temp on previous day
		Gel formation	Opacity					
1	M T Scanty	—ive	—ive	—ive	Nil	1 F b	Sub normal	100 F
2	M T Scanty	—ive	—ive	—ive	1 F b	Nil	99°F	100°F
3	M T Scanty	±	±	—ive	Palp	Nil	98.6°F	98.6°F
4	M T Scanty	±	±	—ive	Palp	Nil	98.6°F	98.6°F
5	M T Fair number	—ive	—ive	—ive	3 F bs	Nil	98.6°F	103.6 F
6	M T Scanty	—ive	—ive	—ive	Nil	Nil	98.6°F	98.6°F
7	M T Fair number	—ive	+	—ive	Nil	Nil	98.6°F	99.5°F
8	M T Scanty	±	+	—ive	Nil	Nil	99°F	107°F
9	M T Scanty	—ive	—ive	—ive	3½ F	Nil	Sub normal	Sub normal
10	M T Scanty	—ive	—ive	—ive	Palp	Nil		
11	M T Scanty	—ive	—ive	—ive	Nil	Nil	Sub normal	100°F
12	M T Scanty	—ive	—ive	—ive	Nil	Nil	102°F	
13	M T Scanty	—ive	—ive	+ (8 years back)	Nil	Nil	Sub normal	99 F

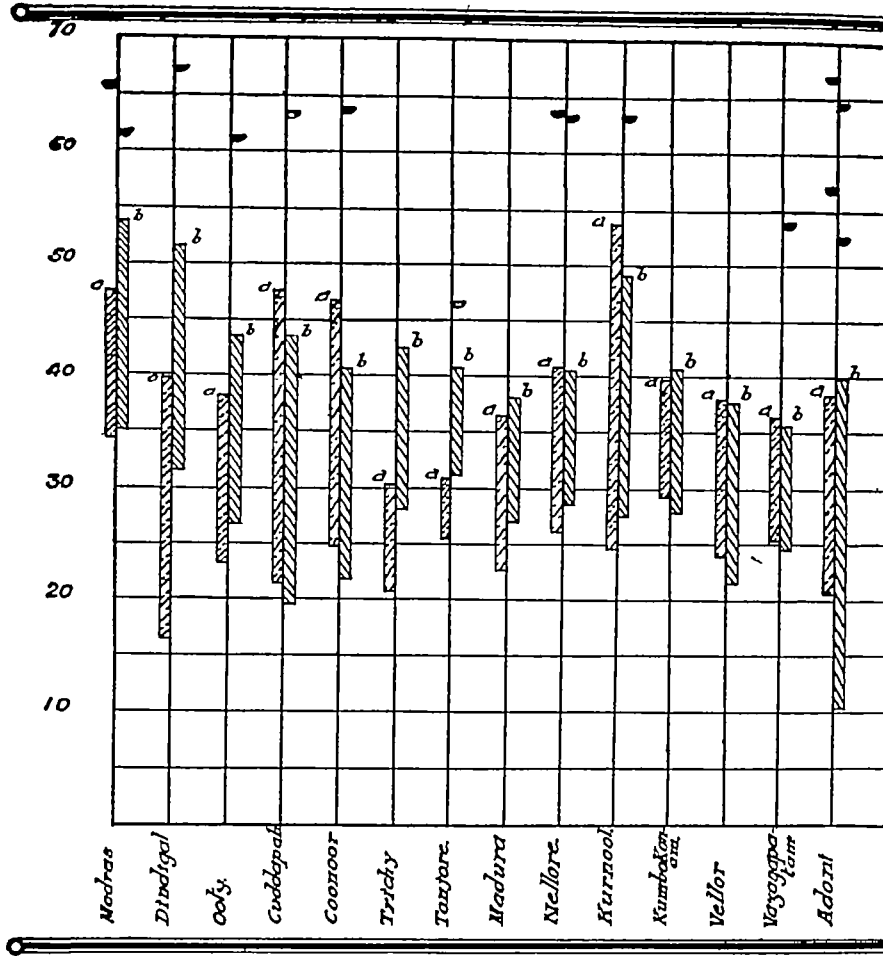
MEDICAL RESEARCH AND SANITARY ENGINEERING

BY V D PILLAI, M.E.C.E.

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14 Towns in Madras Presidency Showing Death Rate per 1,000 people
(b) Last 11 years after water supply
(a) 5 years before water supply



14 Towns in Madras Presidency
(a) First 11 years of water supply
(b) Last 11 years of water supply

In 25 cases reaction, albumen, Russo's test, Diazo test, Ehrlich's "aldehyde test"

In the other 25 cases only reaction and albumen tests were applied

No relation could be established between the results of these tests and the aldehyde reaction. The results noted above would seem to point to the following conclusions—

(a) The aldehyde test as used by Napier is not positive in malaria if the standards of this author be taken

(b) There occurs, however, in some persons infected with malarial parasites a definite opacity formation but to a much less degree

(c) No relation can definitely be made out between the clinical and pathological conditions, the size of the spleen or of the liver and the temperature and the slight reaction that takes place in some of the cases

(d) No relation could be found between the urine tests employed and the aldehyde reaction

My thanks are due to Major J A Sinton, I C, M D I M S, at whose suggestion I undertook this work and whose guidance and keen interest I greatly value. I have also to thank Lieutenant-Colonel E D W Greig, C I E, I M S, Director of Medical Research, for giving me an opportunity to work under the Indian Research Fund Association and also Lieutenant-Colonel A W Greig I M S Superintendent of the Lahore Central Jail for the facilities which he afforded me for work in that institution

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MEDICAL RESEARCH AND SANITARY ENGINEERING

By V D PILLAI, M.E.D.C.E.

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AFTER many years of experience the last P W D Committee has come to the conclusion that the time has come to provide India with a staff of sanitary experts with a specialized training"

The basis for this conclusion in the result of years of medical research, which laid down its summary, that "all diseases are preventible, some by State agency, the rest by the individual himself" These were the words spoken by Lieutenant-Colonel J W Cornwall at the 1st. Madras Science Congress in his presidential address, under the title "The Ultimate Aim of Medical Research" The Sanitary Engineer has thus come as an important agent to supply pure drinking water, to tackle the problems connected with the collection and disposal of sullage water in the best way and in the shortest time, and to advise the town planning engineer about (I) sunlight, (II) ventilation, (III) rat-proof floors and rat-proof roofs, (IV) the construction of sanitary model houses, and (V) the selection of building sites where the sub-soil water is below a certain depth and about other matters relating to public health

The Training of a Sanitary Engineer—To find a ready made man who can grasp the results of medical research, and who can fully devote his time to construct suitable engineering contrivances to meet local conditions such as sub-soil water, climate, habits of the people, facility of obtaining good building materials, etc, is no easy task. Lieutenant-Colonel Glen Liston, I M S said in a previous Science Congress, "I have given to insects the first place among our enemies, because in India at least, two-thirds of the preventible diseases can be attributed to their agency," and expressed regret that Indian financiers cannot and do not see "the miseries caused by these insects to undermine the man power India"

Euclid v Entomology—Sir Harry Johnson suggests a remedy which is more applicable to sanitary engineers than to financiers, "the only practical remedy" he says "is on the educational side, the whole curriculum of our schools wants overhauling, and instead of euclid should be taught entomology or the science of insects, instead of puzzling over algebra boys and girls should be well grounded in elementary zoology, botany and chemistry"

APPLICATION OF RESEARCH

Malarial Engineering—In Hyderabad (Deccan) where the sub-soil water is within two to four feet from the ground there is always malaria, in a large area under the tank bund where there are always leakages under the bund and consequently stagnation of water in pools, keeping the ground always moist and thick with vegetation, there is malaria, in a third place where there is no good drinking water, and where the population is dependent on wells, malaria starts when the rains set in, the sub-soil water getting contaminated by surface percolations, but ceases during the hot season. Thus the problems which the engineer has to face are (I) the supply of plenty of pure drinking water, (II) the prevention of the stagnation of

surface water, (III) the reduction of the summer water level below six feet from the ground by a system of underground tributaries and mains, and (IV) an efficient system of drainage for the quick disposal of sullage water by a careful distribution of surface and underground drainage. In Bombay the development scheme must remain imperfect so long as the surface drainage is neglected, the prevention of damp air outside dwelling houses cannot be effected until the contaminated surface soil is rapidly drained off by laterals, mains, slopes and high basement. In these flat areas the basement of the dwelling houses should never be less than three feet clear of the ground level. Hyderabad is the only place in India where people build

Dysentery and Diarrhœa—Again Tondiarpet ranks second, Perambore coming first, the order being Perambore, Tondiarpet, Chulai, Chintadripet, Purasawakum, Mylapore, having 352, 304, 286, 268, 240 and 129 deaths respectively for the year 1920.

Preventible diseases—(1) Malaria, (2) other fevers, (3) dysentery and diarrhœa, (4) respiratory diseases come under the jurisdiction of the sanitary engineer, on behalf of the State, and of the health officer to help individuals by treatment and by schooling the uneducated. Before dealing with these diseases the following interesting table of deaths in the various districts of the city of Madras, under the several diseases, may be studied.

DISTRICTS OF MADRAS CITY	Tondiarpet	Seven Wells	Egmore	Chintadripet	Washermanpet	Purasawakum	Perambore	Chulai	Triplicane	Vepery	Mylapore
(1) Malaria	55	55	34	30	12	15	18	8	8	3	1
(2) Other fevers	81	65	36	131	150	15	20	19	67	20	117
(3) Dysentery and Diarrhœa	304	127	160	268	231	240	352	286	82	210	129
(4) Tubercle, including Tubercle of the lung	62	50	38	60	33	14	19	24	32	19	18

cottages on high rocks, and houses on high basements.

Municipal Fevers—The town and the unit house. Soon after a water supply to a town is introduced, the State and the individual should look to draining the town as well as the unit house, otherwise there is plenty of work for the medical research student to discover new insects according to the quantity and nature of the waste products thrown out of dwelling places. Several towns in India showed very low death-rates before the introduction of a water supply, yet there has been a steady increase in death-rates subsequently.

Madras Diseases—Madras has had a good water supply for years and these diseases have no chance to take a good hold on the people.

Malaria—According to the Health Officer's statement of 1920, (1) Tondiarpet, and (2) Seven Wells, top the list in high mortality, and (3) Mylapur comes last. The death-rates being 55 for No (1) and (2) and 1 for No (3). Purasawakum has 15, Washermanpet 12 and Vepery 3.

Other Fevers—Washermanpet comes first and Purasawakum last, being 150 and 15, respectively, Tondiarpet gets 81 and Mylapore 117.

The above table shows how the eleven districts in Madras city differ from one another in death-rate, though they are placed under similar conditions of water supply, drainage, facility for building materials, and climatic conditions. Eliminating these common agencies the main variations may be attributed to malaria, other fevers and tubercle, to marshy damp water-logged areas and to over-crowding. But it is for the medical officers concerned to find out the causes of the uniformly high death-rate under dysentery and diarrhœa. The death-rate for this last varies from 352 in Perambore to 82 in Triplicane.

Diseases Classified according to Intensity

If we classify malaria fevers, other fevers, and tubercle in one group, and dysentery and diarrhœa in another group, the total number of deaths in the first is considerably less than the totals in the second group in many districts of the same city of Madras. For 51 in the first we have 82 in the second in Triplicane district, which is well balanced, but for 57 in the first we have 352 in the second in Perambore which is very striking. For 136 in the first we have 129 in the second in Mylapore. And in Tondiarpet where they have an economical system of drainage working, we have 198 in the first group, and 304 in the

abnormal circulations would thus depend on the different general pharmacological actions of the two hormones

When the surgeon performs thyroidectomy for hyperthyroidism, he cuts off the supply of something of which the accelerating effect is the culmination of an action primarily expressed as augmentation, so it would be convenient to know to what size of beat the heart returns when the thyroid hormone in the blood is used up. Unfortunately there is no method for finding this out but we deduce that some part of the post-operative mortality must be due to a reversion to a level of beat approximate to that recorded at the start of my tracings. It is possible also that the hearts of all victims of hyperthyroidism tend after operation to revert to an inefficient level of beat such as is shown above, and that the survivors of the operation are those who re-educate in time some normal function vicariously performed by thyroid intruder. By whatever mechanism survival is effected after operation, however, we obtain from these experiments the therapeutic indication that exhibition of thyroid in diminishing amounts should be a regular post-operative measure so as to give each one sufficient time for this re-education. Post-operatively such a measure could at the worst only temporarily restore the original disease but the exhibition of thyroid in sufficient amounts to do this would be very unlikely.

The condition of the victim of hyperthyroidism is, I think, comparable with that of a drug devotee¹ and appears to require treatment along similar lines when the stimulant is to be withdrawn. Usually the surgeon withdraws the supply of thyroid stimulant but the possibility has also to be considered that a too quick cessation of the disease itself may have unpleasant results, appearing under the guise of complications, but actually due to its cessation, and requiring thyroid therapy for their amelioration.

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THE POSSIBILITY OF LATENT INFECTION WITH B TYPHOSUS

By J W CORNWALL,

LIEUT.-COL., I M S

I WILL first relate the history of an experimental rabbit and then remark on the speculations which it gives rise to in connection with the disease in man. On September 21st, 1922, a rabbit weighing 1400 grams was given intravenously 1/10th of an agar slope of typhoid bacilli. Six days later *B typhosus* was recovered from its heart blood and its aggluti-

nation titre, which before the injection had been less than 1 in 10, had risen to 1 in 1,280. A little later it reached its maximum, 1 in 2,560. Seven weeks after the injection the animal weighed 1,600 grams, and 21 weeks after it weighed 1,630 grams. The titre was then 1 in 320. The weight slowly fell to 1,360 grams at 28 weeks, when the titre suddenly rose to 1 in 1,280. At 34 weeks the weight was 1,140 grams and the titre 1 in 160. About this time the rabbit sustained a fracture of its left femur, but how this occurred could not be discovered. A week later it died, with terminal diarrhoea. Post-mortem the heart blood was sterile, but *B typhosus* was recovered from the bile, jejunum, liver and spleen. The fracture may have contributed to a more rapid end, but the animal's illness began 10 weeks before the fracture and would probably have terminated fatally anyhow.

The rabbit apparently recovered completely from the original injection and 21 weeks later it had increased 16 per cent in weight. Still its protective mechanism had not freed its tissues from the bacillus nor set up a state of complete immunity. During the succeeding 9 weeks it lost 30 per cent in weight and the infecting bacillus, which had been latent, re-established itself. There was a slight immunizing response at that time for the titre rose from 1 in 320 to 1 in 1,280, but the disease gradually overpowered all resistance and killed the animal on May 23rd, 1923, 8 months after the original injection.

I conjecture that the bacilli lived in the gall-bladder and perhaps also in foci in the spleen and liver and marrow for several months without apparent detriment to the animal's health. I say "apparent" detriment, for it must be assumed that during those months toxin was being absorbed from the foci more or less continuously.

The decline in the animal's resistance cannot be satisfactorily accounted for. One would have thought that the absorption of toxin while the animal was gaining weight would have resulted in the formation of antibodies sufficient to prevent the re-establishment of surviving bacilli, but clearly it was not so. One is led then to the belief that the slow absorption of toxin did not increase the animal's resistance but on the contrary acted adversely on the tissues generally and reduced the resistance until the bacilli gradually became dominant and produced the illness which ended fatally after about 12 weeks duration.

The course of the events in this rabbit bears a resemblance to an attack of typhoid in a man followed by a relapse, the difference being that the relapse in man generally follows the original illness without a long interval intervening.

One cannot avoid thinking that on occasion the resemblance may be much closer. Sporadic

cases of typhoid in man often occur in which the source of infection is only guessed at. It seems to me quite probable in certain instances that the real infection may have occurred many months before the outbreak which incapacitates the patient and attracts notice, that it may have given rise to malaise only from which the patient quickly recovered without a diagnosis having been made, and that the severe illness, of which the true nature is evident, breaks out only after the patient's resistance has been lowered either by constant absorption of toxin from latent foci of the bacillus in his tissues or by accidental influences. It may be objected that there is no parallel between an intravenous injection in a rabbit and an intestinal dose in man, but I think that in some instances the final results may be compared. If a rabbit does not rapidly die from an intravenous dose and does not on the other hand rapidly free itself from the bacilli, either of which may happen, the infection may, as described above, become latent with the possibility of a subsequent serious or fatal outbreak. If a man swallows an adequate dose of bacilli they rapidly enter the circulation and pass to all the organs. Subsequently—(1) All the bacilli may be quickly killed off with no disturbance of health. (2) They may establish themselves, multiply and give rise to a typical attack of typhoid fever after the usual incubation period, or (3) Some may escape destruction, and, after producing a slight malaise, lie latent for undefined periods in foci from which conditions subsequently may permit them to emerge, multiply and start an attack of typhoid fever.

In conclusion, I suggest that it is possible for a man to be infected by *B. typhosus*, and to show little or no signs of illness even after the usual period of incubation. Yet the bacilli may be lying latent in foci somewhere in his tissues, liver, spleen, gall-bladder, bone-marrow or elsewhere, and in course of time his resistance is overcome by the continuous absorption of small quantities of toxin. Then the bacilli multiply and spread and a recognizable attack of typhoid follows. It is a thing almost incapable of proof but it is a possibility which it may be useful to bear in mind.

STREPTOCOCCAL AFFECTIONS OF THE SKIN

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From November 1922 we began a study of the streptococci infecting the skin in the Pathological Laboratory of the School of Tropical Medicine. A difficulty arose in the isolation of these cocci from the fact that acute cases do not

usually come to the outpatient department, and most of the cases we see are chronic cases.

Introduction—"Eczema" is a vague term. It ordinarily means any type of chronic skin affection and these so-called cases of "eczema" are really cases of streptococcal dermatitis with superficial staphylococcal infections. In each case a culture was taken on blood agar, glucose agar and ordinary agar slopes. During this period in about 200 cases cultures were made to isolate these streptococci, and 40 per cent showed positive streptococci. The reason for the failures is that the streptococci lie deep in the lymphatics and so are missed unless the tissues are incised, or unless there is weeping, and, secondly, owing to the abundant growth of staphylococcus aureus and in some cases albus, which outgrow the fine colonies of streptococci.

The temperature has got some influence over these growths—during the winter months many cases are seen in a chronic form, but during the summer more acute cases are seen and that is why these cocci can be isolated very easily during the hot season of the year. In weeping and non-pustular varieties the streptococci grow easily in culture.

Clinically—Eczema can be classified as—

- (1) Localised
- (2) Generalised

and further classified according to virulence into—

- (1) Erysipelas—indurative and desquamative
- (2) Cellulitis
- (3) Infective type
 - (a) Superficial, which is often vesicular in type, e.g., Impetigo contagiosa, which leaves no scar at all
 - (b) Deeper lesions, e.g., Ecthyma, which leaves a scar
- (4) Non-infective type
 - (a) Weeping eczema with small vesicle formations which break down easily with oozing of serum
 - (b) Vesicular type, usually associated with ringworm, the hands and feet are affected and these may become purulent from secondary staphylococcal invasion
- (5) Desquamative type, often generalised

Study of the organisms—

(1) **Technique of isolation**—The skin is sterilised with absolute alcohol, one vesicle is selected from the peripheral part and punctured with a sterile needle. If there are no vesicles a deep puncture is made and a little serum is expressed by gentle pressure.

This serum contains a few streptococci, but on culture shows numerous chained cocci. With the idea of getting these cocci easily 1 to 2 c.c. normal saline solution was injected deep into the tissues with a fine hypodermic needle and

after 2 to 3 minutes a little fluid was withdrawn and cultured on the same media, but this method was not very successful

Blood agar and glucose agar are the best media for the original culture. Glucose broth is used subsequently to study the morphological character of the chains. The greatest care should be taken not to inoculate pus into agar tubes because the pus contains a number of staphylococci.

The Table gives the characters of the various strains isolated.

Descriptions of the strains —

Chains are either short, long or medium. Some of the acute cases and the virulent types show long chains of 18 to 20 cocci in 24 hours' broth culture. Avirulent types do not show long chains in broth culture but often medium chains of 8 to 10 cocci. The short chains are not seen in these cases.

Staining—all of them are Gram positive.

Hæmolysis—Each strain was implanted on blood agar slopes and plates. Virulent types often show a distinct green zone of hæmolysis around each fine colony. Less virulent types show only slight green halos around the colonies.

The blood agar often shows patches of discolouration when seen by transmitted light from behind with the naked eye. A point about the associated staphylococcus aureus is that they are also slightly hæmolytic, causing a brown discolouration of the media. Great improvement follows treatment with combined vaccines of these autogenous streptococcus and staphylococcus strains.

Toxicity in lower animals—This was tried in our laboratory with two types of rabbits. The bigger ones are not very susceptible to intravenous injection or to subcutaneous injection. Usually 1 to 2 c.c. emulsion of 48 hours' growth is given through the ear vein, and we observed that cocci from chronic cases do not cause any symptoms, while those from the acuter and comparatively virulent cases cause death of the rabbits in the course of three weeks' time. The symptoms shown are diarrhœa, and arthritis of the hind limbs, and cocci can be isolated from the joint fluid. Younger rabbits are more susceptible to these cocci when given intravenously, 1 c.c. of emulsion of 48 hours' culture kills them from septicæmia in 24 hours, and the cocci can be isolated in pure culture from the heart blood. Subcutaneous injection of the live bacterial emulsion causes neither œdema nor redness of the part.

Sugar reactions—The following sugar tests were used, *viz.*, lactose, dulcitol, salicin, glucose, litmus milk, and the effects of these cocci tested. From the chart it will be seen that *Lactose* was altered in six cases. It is changed to acid, without any gas formation, and these strains are invariably in severe types or acute cases.

Salicin—At present it appears that salicin is not of much importance in differentiating these strains. *Dulcitol* does not play any part in the differentiation of the strains. *Glucose* almost plays the same part as lactose in most cases. Fermentation of lactose is often seen in the streptococci from weeping eczemas which produce lactic acid.

Anærobic or ærobic conditions—In every strain of skin streptococci cultures were grown under anærobic and ærobic conditions. The anærobic method employed was that devised by Macintosh and Fildes during the war. Most of the skin streptococci are both ærobic and anærobic, *i.e.*, facultative anærobes. One finding was that the individual colonies are small under anærobic conditions, showing that their development had been retarded by the absence of oxygen.

Symbiosis—In most cases of streptococcal dermatitis, staphylococcus aureus was also isolated, in a few cases albus colonies were seen on the culture tubes. Hence we tried to see whether the staphylococcus aureus and albus hinder or accelerate the growth of the skin streptococci. First of all aureus or albus were cultured on ordinary agar for 2 days and after scraping off the growth the tubes were sterilised by heat at 60°C for 20 minutes, to ensure complete sterility. The tubes were then again put inside the incubator, and if sterile, the streptococci were inoculated on them. No retardation of growth was noted.

On blood agar—Streptococci and staphylococci were placed side by side and it was seen that they can grow symbiotically.

Conclusion—At present although the work is still incomplete it shows —

(1) That the hæmolytic strains are more virulent than the non-hæmolytic ones.

(2) That most of the streptococci isolated from the chronic cases do not cause death in rabbits by septicæmia, but the animals die after a period of 10 to 30 days from arthritis and diarrhœa.

(3) The lactose-fermenting character is associated with vesiculation and weeping, suggesting that the irritation produced on the vessels and the resultant increased capillary permeability of the condition may be due to the production of end products such as lactic acid.

(4) Staphylococcus aureus and albus grow symbiotically in eczema and do not hinder the streptococci, this explaining their almost invariable occurrence in this disease.

In conclusion I must acknowledge my appreciation of the help given to me by Major Acton, I.M.S., Professor of Pathology, School of Tropical Medicine, and express my debt for encouragement given by him. He always guided me through the difficulties which I often experienced.

The Indian Medical Gazette.

AUGUST

INSULIN

THE discovery of insulin is one of the most interesting and important of recent medical events, and it is now possible to form some idea of the uses and limitations of this substance. The part played by the pancreas in connection with carbohydrate metabolism has long been recognised and attempts have often been made to use pancreatic extracts in the treatment of diabetes. These have always failed because it has not been possible to obtain the active principle of the islands of Langerhans in a pure condition suitable for injection into the human body. Extracts of the whole gland contain substances which are harmful or even dangerous when administered by the subcutaneous route, and administration of them by the mouth is quite ineffective.

After prolonged and painstaking work Professor Macleod and Mr Collip of Toronto have succeeded in obtaining a preparation of the active principle which is concerned with the control of carbohydrate metabolism. The fresh pancreas of an animal is minced, and extracted by 95 per cent alcohol by which most of the protein is precipitated, the filtrate is then evaporated *in vacuo* at a low temperature and an aqueous extract is thus obtained which is washed with ether to remove the lipoids. Further evaporation *in vacuo* reduces the extract to a pasty consistency. Alcohol (80 per cent) is then added and the mixture is centrifugalised and the active principle is obtained in alcoholic solution in the clear top layer. This is pipetted off and mixed with an excess of absolute alcohol in which the active principle becomes precipitated. The precipitate is then dissolved in sterile distilled water, concentrated by distillation *in vacuo*, filtered through porcelain, tested for sterility and standardised.

Insulin when injected into healthy animals causes a great diminution of the blood sugar accompanied by symptoms suggestive of strychnine poisoning, and the standardisation of the substance is effected by finding the amount needed to cause a definite reduction in the blood sugar of a rabbit of a certain weight.

It is claimed that insulin restores the power of metabolising carbohydrates, though Cambridge's experiments suggest that the diminished sugar in the blood is associated with a deposition of glycogen in the tissues.

Insulin has yielded striking results in the diabetes of children and young adults, suitable doses causing a rapid disappearance of sugar from the urine and a great improvement in the general health. An overdose causes a diminution of the blood sugar below normal limits and serious or even fatal results follow, hence the absolute necessity for skilled control of the administration of the drug. Estimates of the blood sugar must be made before and after the injections until the suitable dose is found, and in case of untoward symptoms or excessive reduction of the blood sugar glucose has to be given intravenously.

The following points must be borne in mind in connection with insulin —

I It is difficult and expensive to make, it is likely that the published details are not sufficiently explicit to enable even the expert chemist to obtain the substance any more than the published details of the manufacture of "606" were a full statement of the process of preparation of that drug.

II Its keeping properties have not yet been clearly stated.

III Insulin is now available on the Indian market, the present price is Rs 25/- for a phial of 100 units.

IV The supply as yet is small and so insulin should not be used for patients whose urinary sugar can be controlled by reasonable restrictions of diet.

V It is of great service in diabetic coma and in persons who have gangrene, carbuncle or other serious complications of diabetes.

In coma doses of 10 units every hour for three doses and then every two hours. In all 60 units may be given.

VI The treatment involves the giving of a hypodermic injection half an hour before food twice daily, the average dose being 11 units daily. The dose ranges from 5 to 40 units daily. The initial dose should be small and should be gradually increased until the blood sugar comes to normal. It should again be diminished gradually and kept at the lowest possible point.

VII Insulin is dangerous if administered to persons with renal glycosuria, or if given in overdoses to true diabetics,

The symptoms of overdosage are weakness and nervousness followed by sweating. Immediate relief results from giving two or three teaspoonfuls of sugar or by 5 to 20 grams glucose intravenously.

VIII Insulin is not a "cure" for diabetes; it is merely a means of counteracting some of the serious effects of the disease, and its administration will have to be continued indefinitely, except in the rare cases in which there is a temporary disturbance of the internal secretion of the pancreas. It is possible that a short course of insulin may cause such an improvement in the general health even of the average case of diabetes that the patient may be enabled to start on his dietetic régime under more favourable conditions than would otherwise be the case, but it is likely that the great majority of early cases of the disease in India will neither need nor benefit from insulin.

It is most important that exaggerated anticipations should not be aroused as to the results which may be expected from insulin. The solution of the problem of diabetes in India does not lie in this or any other panacea, it lies in the practical application of the lessons of experience. It is pretty clear that 90 per cent or more of the cases of diabetes in India are preventable by the adoption of a rational diet and mode of life, it is also certain that diabetes which has resulted from dietetic errors can be thoroughly controlled in its early stages by suitable diet and exercise, and that the results obtained by regiminal treatment will be better and more lasting than those following on any course of injections.

Insulin will doubtless play a most important part in the treatment of diabetes, but this will consist in the controlling of the grave juvenile cases which depend on a primary disease of the pancreas and in relieving the serious complications of all forms of the disease.

As the manufacturing chemists are likely to take steps at an early date to supply the great demand which is sure to arise in India for insulin, it is well that the medical men of the country should be prepared to give rational advice to their patients regarding the drug, for there are great possibilities of evil as well as

of good if the use of insulin is not scientifically controlled. A repetition of the tragedy of Koch's tuberculin must be avoided at all costs.

A Mirror of Hospital Practice.

A MULTILOCLULAR OVARIAN CYST

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A BURMESE woman had had an enlarged abdomen for about 17 months, during the earlier part of which period she had been regarded by her friends and Burmese "doctors" as pregnant. As nothing eventuated she came up from her village and was admitted as an in-patient.

State on admission—T = 99.4 P = 94. The abdomen is enlarged by a swelling which is more pronounced on the right side but which also extends to the left. In the middle line hard nodules can be felt. On percussion the abdomen is uniformly dull in the region of the swelling. Per vagina, an old cervical tear can be felt on the left side of the cervix. The uterus appears to be movable and not connected with the abdominal mass, the swelling does not extend into the pelvic cavity. Heart, lungs, appetite and sleep normal.

Present history—Patient is a 5-para, her youngest child being two years old. She has had amenorrhœa for the last three months and says she felt foetal movements six weeks before admission to hospital. The breasts appear shrunken and no fluid can be expelled.

Catheterization of the bladder resulted in 6 ozs of urine being drawn off but caused no difference to the tumour. Examination of urine—normal.

Operation—There was a difference of opinion as to the diagnosis and for the first six days the patient was under observation. A multilocular ovarian cyst appeared to be the most likely diagnosis and consequently operation was resorted to. I accordingly opened the abdomen through a mid line incision and was pleased to find my diagnosis confirmed. The tumour was a typical multilocular ovarian cyst of the left ovary. The pedicle was three inches long. The greater omentum was adherent to its anterior surface. The tumour was removed entire. The right ovary showed small cystic nodules but was otherwise normal in size. The uterus was of the size of a three months pregnancy, cystic in character and bled very easily. A diagnosis of a three months pregnancy was made.

The tumour weighed exactly 20 lbs., and was 35 inches in its largest circumference and 20 inches in the opposite circumference. The hard nodules felt in the mid line were calcareous in character.

The patient made an uneventful recovery and left for her home on the 25th day, the wound having healed by primary union.

Three and a half months later while inspecting one of the outlying stations I met this patient. The Assistant Medical Officer in charge told me that she had only recently recovered from a miscarriage for which he had been called in, he estimated that the fetus was 6 months old. She had apparently slipped on some wet boards while bathing and gave that as the cause of the miscarriage.

SOME EYE CASES

By Dr. S. K. GANGULY,

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I. Cataract in an eye with bad projection of light

H. M., 88, a medical practitioner, came for cataract extraction in the left eye. Vision was closed for two years. The pupil was reacting well to light. Projection of light was bad and the lens was over-ripe. The patient's arteries were seen pulsating over his face and neck and wrist and were as hard as gas pipes. The right eye had an immature cataract with vision = finger count at 3 feet.

After extraction of the left lens with iridectomy and capsulotomy, the patient could count fingers on the second day. The same night he hurt his eye with his hand. On the third day the anterior chamber was seen to be full of blood. On the fourth day the blood was nearly absorbed. The same night he fell from his bed and injured his eye again and cut his forehead. Bandaging and atropine plus diamin drops had to be continued for two weeks more. Two months after the operation he returned and with glasses had good sight.

II. Sympathetic Inflammation after injury

(a) M. M., 45, came with a smashed left eye caused by the bursting of a soda water bottle hitting the eye with force. Enucleation of the left eye was advised, but the patient would not have it. After a year he returned with an atrophied left eye and sympathetic inflammation of the right eye in which "K. P." posterior synechia and slight ciliary injection had appeared. Vision in the right eye had decreased to finger count at 3 feet. The left eye was now enucleated and salicylates and mercury were exhibited with the result that vision improved very much after 5 weeks. He is now working as a clerk.

(b) H. M., 28, had the right eye injured with a piece of hot steel and enucleation was advised when he came on the fourth day. To this he did not agree. After six months he was brought blind in both eyes owing to sympathetic inflammation.

III. Perforating Injury of the Eyeball

H. M., 40, compounder, was preparing an effervescent mixture in a bottle when it burst

and a piece of glass penetrated the globe of the right eye behind its equator, but fortunately the ciliary region escaped. The glass was pulled out with the escape of a little vitreous through the clean cut linear wound measuring about $\frac{1}{2}$ inch long. A bandage was applied for four days. The patient had an uneventful recovery with 6/6 vision.

IV. An acute attack of Glaucoma after Cocaine

H. M., 24, a medical student asked me to test the tension of his eyes with the tonometer. As soon as two drops of a 5 per cent solution of cocaine hydr. were applied in the eyes, an acute attack of glaucoma set in with ground glass cornea, intense pain and ciliary injection. Repeated instillation of eserine, hot baths to the eyes, leeches were applied and continued, as he would have no operation in the eyes. In fact he told me that he had been suffering from glaucoma after epidemic dropsy, but would not consent to the operation which was advised by his professor, and that on the previous day (which was the hottest one in summer) he strolled through the streets following a procession. He left the clinic with normal tension.

V. Vitreous Haemorrhage

H. M., 21, came with vitreous haemorrhage and blindness in the right eye. The haemorrhage started three months ago and gradually made him blind in spite of treatment. His left eye was normal. The patient's blood was W. R. positive 60 per cent. He had no history of syphilis. The coagulation time of the blood was normal. He used to fly kites.

The patient's elder brother, about thirty-three years of age, became blind in both eyes through vitreous haemorrhage and that in spite of treatment.

VI. Chronic Iridocyclitis

A Hindu female child, aged 10 years, was brought to me for treatment of a localised spot of redness about the size of a mustard seed on the conjunctiva, but situated just to the inner side of the cornea of the left eye. The father put it down to the accidental application of a little slaked lime. The girl was apparently healthy and the examination of the eye did not reveal anything abnormal. The redness persisted in spite of treatment. After three months the father reported the appearance of a whitish dot on the "black" of the eye. The eye was again examined and showed "K. P." and posterior synechia. The tibiae were now examined and showed periostitis and the father gave his own history. The vision was normal and very little ciliary injection was present. The teeth and ears were normal. The other eye soon became affected.

A LIPOMA OF THE THIGH

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 Hospital*

THE patient was a boy aged about 15 years who had walked in from Yunnan, China, with the yearly immigrants who came to work at the mines here. The journey takes about 45 days. He was working in the Mining Department as a coolie when he came to the Bawdwin Hospital for sores around the anus. He was transferred to Namtu for treatment.

On admission

The left thigh is occupied by a large tumour (*vide* photograph), which is painless and hard and which extends from the greater trochanter above to the patella below. The tumour bulges outwards. The patient walks with a peculiar rolling gait as if a weight were attached to the thigh.

Dimensions

	Right thigh	Left thigh
Largest circumference around thigh	15½ inches	24 inches
Length of tumour top to bottom		17 inches

On the penis is a sore. A smear taken and examined by the dark ground method disclosed live *Spirochæta pallida*. There are several condylomata around the anus.

Inguinal glands, supratrochlears and cervical glands enlarged and hard.

Previous history—The tumour has apparently existed from infancy but has grown in size during the last 15 years. It has caused no pain or other trouble except limping. The chancre has lasted five days and the condylomata one month.

Patient strenuously denies intercourse, either active or passive.

Two days after admission 2 c.c. trepol was injected into the left buttock followed three days later by another injection in the right buttock.

Operation—The day after his second injection the patient was operated on for his lipoma. Anaesthetic, chloroform and ether.

A longitudinal incision was made over the tumour and the skin separated and retracted. The vastus externus was seen tightly stretched over the tumour. The muscle was split longitudinally, and the tumour was seen to be a multilobulated lipoma. The fibrous tissue which intervened between the numerous lobules came together at the pedicle, which was fixed like a muscle along a linear attachment to the posterior aspect of the femur (*Linea aspera*). A muscle belly, probably the crureus (*Vastus intermedius*) was incorporated in the tumour and had to be removed with the lipoma

which was excised intact. The split vastus externus was sutured with thick interrupted catgut and the skin closed with mattress sutures. A drainage tube was inserted at the distal extremity of the wound.

The tumour weighed 7 lbs.

Post-operative period

After operation the routine rectal injection of

Glucose	1 oz
Brandy	1 oz
Sodium Bicarb	30 grs
Saline ad	10 ozs

was given. The pulse, however, became very feeble and rapid—over 130 per minute. The bed was raised at the foot and strychnine and digitalin gr 1/50 each, given subcutaneously. The condition of the patient, in spite of the above stimulation, remained very dangerous. Three hours later pituitrin 1 c.c. was injected and saline 1 pint given intravenously, after which his condition improved somewhat.

The day after operation the patient, whose condition was unsatisfactory (pulse = 132 temp = 99.2) vomited two round worms (*Ascaris lumbricoides*). The wound area became swollen and tender. Next day his condition was still bad (pulse = 140, temp = 99.2), the tube was removed and 2 ozs of blood escaped, the tube was cleaned and re-inserted when a further 3 ozs of blood escaped. The patient vomited another live round worm. Adrenalin chloride solution (m 15 in normal saline 1 oz) was injected through the tube. The thigh was tightly bandaged to prevent further bleeding and calcium lactate gr 20 was given t.i.d. On the third day pulse was good (96), on the fifth day the tube was removed and on the eighth day after operation the stitches were removed. The wound healed by primary union except in the region of the tube where it healed by granulation. The temperature never exceeded 99.2 and remained normal after the 8th day.

Two further injections of trepol, 2 c.c. intramuscularly, were given before the patient was sent back to Bawdwin where he is under further trepol treatment by the Asst Medical Officer, stationed there. Before his departure the chancre and condylomata had disappeared.

A CASE OF HYDATID CYSTS OF BOTH LOBES OF THE LIVER

By ERNEST F NEVE, M.D., F.R.C.S. (Edm),
Surgeon Kashmir Mission Hospital

MAHAMDHU, a Mahommedan boy, aet 12, was admitted January 13th, 1923. For four months previously he had noticed a great enlargement of the upper abdomen and had suffered from indigestion and constipation.

A CASE OF LIPOMA OF THE THIGH

By Dr L W HEFFERMAN, MRCS., LRCP.



Condition on admission—Great enlargement of the liver the left lobe of which projects five inches below the costal margin. The swelling is tense and firm but elastic. There is no distinct thrill. On the right side there is also a deep seated mass in the hypochondriac region. The patient is jaundiced. His face is pigmented with dusky patches. The cornea appear unusually bright. There is some night blindness and an excess of retinal pigment.

Treatment—With a hypodermic syringe and fine needle the left lobe of the liver was explored and clear fluid drawn off which under the microscope revealed hydatid hooklets. An anæsthetic was then given and a vertical six inch incision made one inch to the right of the middle line in the epigastrium. With a trocar and cannula the contents of a very large cyst occupying most of the left hepatic lobe were evacuated. The opening was enlarged and the endocyst, which was covered in front by about 1½ in. of liver tissue was removed entire.

The deep seated mass on the right side proved to be another enormous cyst occupying the right lobe of the liver and extending down behind the duodenum and pancreas which were lifted forwards giving a feeling of solid resistance. A trocar was passed between the duodenum and the gall bladder, the fluid was evacuated the opening enlarged and as much as possible of the endocyst removed but it was adherent and friable and did not turn out like the other. Both cavities were carefully dried with swabs and separate "dressed" drainage tubes inserted that on the right being brought out through a stab puncture and the left one at the upper angle of the wound.

Convalescence was rather protracted. The temperature remained normal throughout. The discharge was heavy from the first day and contained much bile. Pieces of cyst wall were frequently discharged. The drainage tubes were not finally removed till April 11th. Ten days later the wound was healed and he was dismissed.

The chief interest of the case is its extensiveness. The liver was almost out of work so much of its substance being thinned out and atrophied from pressure. I have met with night blindness in cases of hepatic cirrhosis. Its existence in this case, coupled with pigmentation, throws some light on a function of the liver which is as yet imperfectly understood.

A SERIES OF CASES RESEMBLING PARALYTIC ILEUS

B. W. W. JEUDWINE

LIEUTENANT-COLONEL, I.M.S.

Civil Surgeon, Delhi

The following cases have come under my treatment during the last three years and I

am publishing them, not only on account of their interest, but also to invite correspondence as to the cause.

I can find nothing described in the various systems of surgery which in any way resembles the cases under report.

Case I

In July 1921 at Rawalpindi Civil Hospital a well developed young Punjabi, aged 22, came in complaining of abdominal pain and giving a history that his bowels had not been open for 10 days. He did not appear to be in the least distressed, and except for a distended abdomen was otherwise normal. His tongue was clean, pulse 80, temperature 98. Pain was of a general character and no special point could be elicited on palpation. Per rectum nothing abnormal was felt. He was admitted and given an enema with oil, soap and turpentine. Water only by the mouth.

Seen the next morning, his general condition was the same. There was no sign of peritonitis. The enema has been passed almost clear. The abdomen remained distended and he complained of rather severe pain. A second enema was given and ½ cc pituitrin hypodermically. He passed urine but no flatus and the wash out was returned clear.

Seen again the following day he was in the same condition. He had not vomited, there was no rigidity, his pulse remained 80 and his temperature normal. He however complained of more severe pain so I decided to do a laparotomy. The operation was done that morning under chloroform. On opening the abdomen free blood stained fluid escaped at once (I suppose in all there were 2 pints of free fluid), the small intestines in large distended coils, purple in colour, evacuated themselves and were immediately surrounded by hot saline towels. The large intestine was seen to be equally distended, but not so discoloured.

No line of demarcation of strangulation was seen, in fact the large intestine was distended down to the lower sigmoid. A rectal tube was passed well up the lower bowel and at the same time the small intestine was punctured by a large trocar and cannula and the contents as much as possible evacuated. Two ounces of Mag Sulph in 10 ounces of water was introduced into the small intestine at the last puncture. Four punctures in all were made, three in the small and one in the large intestine. The intestines were returned fairly easily and the abdomen closed.

Pituitrin ½ cc was given 4 hourly for 6 doses. The rectal tube was left *in situ*. The patient was kept in Fowler's position and only sips of hot water given by the mouth. The patient made an uneventful recovery and left the hospital 14 days later.

Case II

At Rawalpindi two weeks later a frail woman, aged about 40 walked into hospital complaining of abdominal pain and giving a history of absolute constipation for 14 days. As in the last case except for a distended abdomen there were no signs or symptoms of disease. She was a feeble creature with a small pulse and no physical reserve. She was given an enema as in the previous case with the same result.

The next morning as she was no better, I decided to do a laparotomy and the operation was done as in the previous case.

On opening the abdomen there was no free fluid but the intestines had the same purple appearance and were greatly distended. The same routine was carried out as rapidly as possible and the abdomen closed.

In spite of pituitrin camphor in oil, nuxvomica and enemata, her bowels refused to act and she died 3 days later.

No obstruction was found at the time of operation and on post mortem no signs of inflammation, kinks or bands.

Case III

At Jullundhar in November 1921 an emergency case of intestinal obstruction was admitted at 5 p.m. He was an old frail wizzened up man about 60 years of age.

He gave a history of absolute constipation for 14 days and had a distended abdomen with some abdominal pain. He had come in by road 18 miles in an ekka and had walked from it to the surgery.

He was given an enema and a stimulant draught. The enema produced no result.

At 6 p.m. a laparotomy was performed. Free blood stained fluid escaped from the abdominal cavity.

The small intestine was distended but the most curious feature was that the internal and muscular coats appeared to have given way in places. The peritoneal coat only remained intact and was distended in large beads, each about the diameter of a sixpenny piece.

The case was so obviously hopeless that a Paul's tube was tied in and the patient returned to the ward. He died the same night. In getting the Paul's tube out the abdomen was opened and again no visible obstruction was found.

Case IV

At Delhi in January 1923 a Pathan boy aged about 18 was admitted with a history of 9 days constipation and a painful distended abdomen. His tongue was foul, pulse 100 temperature 99.

An enema was given without result and he was operated on almost immediately afterwards.

The same condition of the intestines was found, except that the large intestine was not so distended.

The only possible cause of obstruction was a slight mesenteric kink at the hepatic flexure of the large intestine, but this was not sufficient to cause more than slight partial obstruction.

The gut did not contract down well after evacuation of the contents by the cannula, nor did much material or gas escape by the rectal tube.

In spite of all the usual remedies he never passed flatus and died 3 days later.

If a complete post mortem examination had been possible on these three cases some cause might have been found to account for the condition, but what about case (1) who was apparently of the same type?

I feel that I cannot be the only Civil Surgeon in India who has come across this type of case and should be glad to hear the experience of others.

In the first two cases I was assisted by Assistant Surgeon Gopal Das and Sub-Assistant Surgeon Chand Naram. In the third case by Khan Sahib Mohammad Sharif, and in the last case by Lt-Colonel H. Halliday I.M.S.

A CASE OF BLINDNESS PRECEDING APOPLEXY

By CAPT A. P. PILLAY, OBE, MB, BS

Sholapur Road, Poona

GANGABAI aged about 70, consulted me for giddiness and inability to see on the 20th March. Both these came on suddenly the previous evening. As it was a particularly hot day, the complaints were put down to the effects of heat and treated accordingly. The next day, her giddiness was gone but there was no relief in the blindness which was complete. She was not able to see fingers even at the distance of a few inches. She was advised to consult an eye specialist.

I did not see her again till the 26th, when she had an apoplectic seizure and was unconscious. She died on the 28th.

I asked the eye-specialist she consulted when I met him a few weeks later, as to the result of his examining the patient's eyes. He said that he did not find anything definite except signs of arterio-sclerosis and that he had asked the patient to see him the next day, with her urine which she did not do. Dilatation of the pupil was not done.

Apparently the blindness was a prodromal symptom of the seizure as she never recovered her eyesight till her death. Could any of your readers suggest the probable pathological change that caused the blindness in this patient?

Current Topics

A Note on the Psycho-Analytic Polyclinic in Berlin

A NOTABLE point in the development of psycho-analysis has been reached in Berlin with the inauguration of a polyclinic for psycho-analysis. This is the first clinic devoted entirely to psycho-analytical work to be started in Europe.

The following details of its constitution and achievements are taken from a recently published pamphlet (*Bericht ueber die Berliner psychoanalytische Poliklinik Marz 1920 bis Jun 1922*). The author of the pamphlet Dr Max Eitingon accords the credit of the original idea to start in Berlin a clinic for psycho-analysis to the late Dr Anton von Freund.

The chief *raison d'être* of the clinic are (1) to afford to the general public better facilities for psycho-analytical treatment and (2) to create a centre for teaching the principles and practice of psycho-analysis.

The ruin of Germany which followed upon the signing of the Treaty of Versailles precluded any possibility of financial assistance from either the Government or from the Municipality. The founders had to rely entirely upon private sources to meet the initial cost. It speaks very highly for the courage and tenacity of purpose of Dr Eitingon and his collaborator Dr Simmel that they managed to succeed at such a time and in face of such difficulties. In the summer of 1919 they obtained permission from the Berlin Psycho-analytical Society to open and conduct a clinic. Among the many practical points that had to be considered and settled before the clinic could be considered a going concern was the question whether it were better to invite the co-operation of a number of part time workers or to confine the staff to a few persons prepared to devote the whole of their time and energies to the work. In the end the latter arrangement was adopted so as to ensure continuity of both labour and objective. The Polyclinic was eventually opened in February 1920. To begin with there were five rooms in which treatment could be carried out but this accommodation was soon to prove insufficient. The staff at first consisted of Drs Eitingon and Simmel and a lady doctor Fräulein Dr Smeliansky. These three carried out between them a daily programme of 14 hours work. Later two members of the Berlin Psycho-analytical Society placed their services at the disposal of the clinic and undertook some analysis. Gradually other helpers joined up including two more lady doctors Frau Dr Horney and Frau Dr M Klein. In December 1920 Dr Harnik of Budapest arrived and in the spring of 1921 the clinic was able to enlist the valuable services of so experienced a psycho-analyst as Dr F Alexander. By 1922 the staff included seven permanent workers and the output of work varied from 25 to 28 hours a day. In addition to the permanent staff much help was accorded to the clinic by six of its students among whom there was one female student of psychology.

The direction of the clinic was vested in Dr Eitingon in consultation with Dr Simmel. Besides the assistants to Dr Eitingon named above he was helped further by Fräulein Schott who undertook psycho-analytical work on children. To each assistant is paid a small salary. This remuneration is quite out of proportion to the services rendered by each to the clinic, but the financial status of the clinic makes it impossible to offer anything like an adequate return. The courageous devotion of these workers in psycho-analysis can perhaps best be realised by a glance at the figures of its budget.

Expenses	Income.
1920 Feb to Oct Marks 20 000	Marks 2 500
1920 21 October to October Marks 60 000	17 500
1921-22 October to October, Marks 150 000	25 000

When one realises that in October the rate of exchange was such as to make the value of the annual income of the clinic (Marks 2,500) equal to about Rs 50 it is easy to see how much the clinic had to contend with!

In the 2½ years of its existence over 600 cases have passed through the clinic. In 1921 there were as many as 50 to 60 cases undergoing analytical treatment at the same time. It would appear that at first all kinds of cases came to the clinic for treatment including cases of long-standing neuroses organic nervous conditions and such like. The following table gives an idea of the classes from which cases were drawn—

Profession	Males	Females
Working Classes	25	35
Officials	22	41
Civil Servants	7	3
Teachers	16	19
Servant Class	nil	27
Shopkeepers	23	nil
Students	12	2
Learned professions	56	59
Married women (no profession)	nil	63
Widows	nil	6
No profession	2	8

Treatment was carried out on five days of the week. On one day in the week and on Sundays the clinic is closed for treatment. The time allowed to each patient varies from ½ to a full hour. Patients come for treatment thrice or four times a week. Severe cases come more often.

Every patient is expected to pay a fee according to his or her ability to do so. When payment of any kind is obviously quite out of the question the analysis is done gratuitously. Dr Eitingon makes special mention of the employment of a modified form of psycho-analysis which he calls "fractional analysis". By this is meant the analysis of certain cases up to a point when the analysis is broken off and the patient is encouraged to try and carry on with the self-knowledge that he or she has acquired so far. Should the patient fail to deal successfully with the results of the partially-analysed conflicts, he is encouraged to return and pursue the treatment further.

Such procedure has been found by experience to curtail the time taken to establish a complete cure as well as to afford economy in time taken up in the treatment.

In addition to the therapeutic work of the clinic, there is also an organised system of instruction. In 1920-21 and again in 1921-22 Dr Abraham, on whom most of the teaching work has developed, carried out the following courses of instruction.

1920 In the Spring An introductory course in Psycho-analysis

1920 In the Autumn A similar course (On both occasions the course was attended by 20 to 25 students.)

1921 January and February A psycho-analytical course for advanced students with special reference to new work in psycho-analysis (Attended by about 12 students.)

1921 May and June An introductory course (30 students.)

1921 November and December An introductory course (30 to 40 students.)

1922 January and February Same as in previous year (20 students.)

1922 May and June Introductory course entitled 'Experiences in psycho-analytical practice' (30 students.)

Besides these lectures, Dr Sachs lectured on "The Theory of Dream Interpretation" "The Technique of Dream Interpretation" and "Sexual Problems in the Practice of Psycho-analysis". He also gave a course of addresses on the practice and application of psycho-analysis. Drs Horney and Simmel lectured on "The True Aspect of Psycho-analysis for the General Practitioner" and on "Psycho-analytical Technique".

Drs Eitingon and Simmel gave between them a course of introductory lectures on "Psycho-analytical Therapy"

Dr Eitingon maintains that the work of the clinic has established more strongly than ever the importance of an analysis being carried out on whomsoever aspires to practice psycho-analysis on others. This part of the training of students in the practice of psycho-analysis has been undertaken by Dr Sachs who analysed, partly or wholly, 25 students. Among these pupils of Dr Sachs were 13 medical men, 5 medical women, one medical student, 5 school teachers and one woman student of ethnology. Of these 25 students 9 were foreigners, *viz* one Austrian, 4 Hungarians, one Dutchman, one American and two Englishmen.

Dr Eitingon refers to the difficulty experienced in providing against the infliction of any injury on patients who were undergoing psycho-analysis at the hands of beginners. This was partly achieved by a careful watch being kept over the work of each beginner as well as by the provision to each student of minute directions as to the procedure to be adopted in carrying out an analysis. Patients were still further protected from injury at the hands of the beginners by the right reserved to the staff to take over any case whenever there should arise indications to make such procedure necessary or advisable.

On the whole Dr Eitingon expresses himself very satisfied with the progress of the pupils of the clinic.

The report concludes with statistical tables dealing with the pathological material handled by the clinic.

The first list of cases treated consists of 16 patients. The sex, age, occupation, diagnosis, duration of treatment and result of these 16 cases is tabulated as follows—

and the patient assured that he is cured, or requires further treatment according to the result. Cultures of urine or of the secretions of the prostate and seminal vesicles do not furnish a reliable result, instances or relapse or of the development of iritis or arthritis after such cultures have proved negative, being only too common. That the absence of a gleet and of threads in the urine is no criterion of cure is shown by the number of cases in which abundance of polymorphonuclear leucocytes can be demonstrated in the secretions obtained after prostatic massage and by the large numbers of such "clinical cures" which relapse or develop complications, often after a lapse of some years.

The system of treatment followed is that of urethro-vesical irrigation, combined with prostatic massage after the subsidence of acute symptoms, up to the stage of complete disappearance of all discharge or gleet. At this stage the anterior urethra is examined with the urethroscope and instrumental treatment such as cauterisation of follicles, dilatation of infiltrations etc. undertaken when necessary. The systematic record of the condition of the posterior urethra and its adnexa is commenced at this stage. After filling the bladder with a solution of oxycyanide of mercury 1-2,000 the prostate and vesicles are massaged and a drop of the mixed secretions is spread out evenly on a slide, the film is stained and examined under a 1/12 in objective the number of polymorphonuclear leucocytes in 20-30 fields is counted and the average recorded. If gonococci be found, or large numbers of other organisms the case is put back on to daily irrigations, otherwise the treatment consists only of prostatic massage twice weekly, preceded by an irrigation. After each massage the fluid in the bladder is passed out and threads, plugs, etc., examined

M	E	Profession	Age	Diagnosis	Duration of treatment	Result
1	—	Workman	19	Stuttering	5 mos	Improved
—	1	Housewife	—	Anxiety hysteria	8 "	Notably improved
1	—	School boy	18	Compulsion neurosis	9 "	Improved
—	1	School teacher	23	Anxiety hysteria	4 "	Do
1	—	Head master	—	Psychic impotence	6 "	Do
1	—	Civil servant	—	Compulsion neurosis	8 "	Cured
1	—	Shopkeeper	—	Conversion hysteria	4 "	Improved
1	—	Medical student	23	Neurosis	3 "	Do
—	1	Accountant	28	Anxiety hysteria	1 mo	Treatment discontinued
1	—	Teacher	36	Latent homosexuality	7 mos	Unchanged
—	1	Accountant	17	Passionate nature	6 "	Do
—	1	—	—	Hysterical headache	4 "	Cured
1	—	Artist	—	Compulsion neurosis	5 "	Improved
1	—	Student	21	Excessive onanism	2 "	Unfinished
1	—	Civil servant	33	Neurotic character	2½ "	Unchanged
1	—	School boy	18	Conversion hysteria	1 mo	Do

To those who are at all interested in psychiatry and more especially to those who have studied psycho-analysis, the foregoing extracts from Dr Eitingon's report on the work of the Psycho-analytical Polyclinic in Berlin cannot but afford considerable pleasure not only as regards the work actually carried out but also in respect to the tenacity of purpose of the two founders, Drs Eitingon and Simmel and their devoted staff.

OWEN BERKELEY HILL

The standard of cure in the treatment of Gonorrhoea.

By W L HARNETT FRCS

MAJOR, I M S

Lancet, February 17th 1923

In this paper the author describes a system by means of which the progress of a case of gonorrhoea may be followed up to the stage when tests may be applied

both microscopically and macroscopically. Cell counts are made in this manner at fortnightly intervals, the results being recorded as the average number of polymorphs per field. In the meantime the patient lives his ordinary life, except that alcohol, sexual indulgence and hard exercise are forbidden. It is found that the cell count drops steadily from 15 or upwards per field to less than 1 per field. When this stage is reached the patient is ready for the final test. For this all treatment is suspended for ten days and the patient takes alcohol regularly for the last three days. He is then tested after holding water for some hours, if the urine is free from all plugs and threads, no lesions of the anterior urethra can be detected by the urethroscope and if the slide of the mixed secretions shows a cell count of 1 per field or less, the case is passed as cured. A count of 2 per field may be accepted as a probable cure provided that a repetition of the test two weeks later during which period no treatment is administered gives the same result.

Out of 88 cases thus treated, 64 reached a standard of 1 per field or less and 10 that of 2 per field in a period of treatment varying from 3 to 4 months. Not one of these cases is known to have relapsed, though the conditions under which the investigation was undertaken (an Indian General Hospital at Constantinople) were such as to ensure that any case which relapsed would have been readmitted to the same hospital. In several instances opportunities recurred of investigating the condition of these patients some months later, and in all cases the prostatic films were found to give the same or better counts as on discharge from hospital. The probability that these patients were really cured amounts almost to certainty.

Cases which proved refractory were examined by the posterior urethroscope and treatment with Kollmann's dilator and other methods were adopted. In some of these the results were equally satisfactory, though the period required was longer. In only 3 cases of the series was treatment abandoned after failing to reach the required standard in five months.

The Chronic Abdomen

By ROBERT HUTCHISON, M.D., F.R.C.P.

B. M. J., 21st April, 1923, p. 667

In this delightful address Dr. Hutchison breaks a lance with the over-ardent advocate of laparotomy as a cure for everything abdominal. The subject of "the chronic abdomen" is one of that curious class of patients who take pleasure in their pains, who record with pride the tally of their operations.

"who with sad prayers the weary doctor tease

To name the nameless ever new disease,"

and whose dreary litany is day by day and in every way I get worse and worse."

The "abdominal woman" is usually a spinster, not infrequently a nurse often a childless woman in comfortable circumstances, the male subject not infrequently a Jew, or a doctor. The "abdominal man" however is a *rara avis* as compared with the frequency of the condition in the gentler sex.

The patient as a rule has many and constantly changing complaints. They are by no means confined to her abdomen but may range from a susceptibility to headaches to an inability to think and neuralgic pain all over. Constipation, flatulence and epigastric discomfort signally affect these patients. They are easily tired, mentally and physically, their uterine functions are usually supposed to be out of order, and most of them are pursued with visions of the dangers of the visceroptosis from which they have been informed that they are suffering. The evolution of the "chronic abdomen" usually repeats the same sad tale: "the road to chronic abdominalism is paved with operations." The usual sequence seems to be this: the patient begins by complaining of pain or discomfort in the right abdominal fossa, for the relief of which the appendix is removed. For a few months she is better. (It is characteristic of the disease that almost any new treatment, and especially any operation, produces benefit for a time.) Soon however her symptoms return. This is put down to 'adhesions' and another operation is performed with the same result as the first. Warming to his work the surgeon undertakes bolder and yet bolder proceedings: a complete hysterectomy is probably carried out or some short-circuiting device or the colon is fixed or even partially removed but still the patient is not cured of the pains, whilst the state of the nervous system has steadily worsened.

"Meantime, and between the more dramatic entries and exits of the surgeon the physician has not been idle. The patient has been thoroughly 'investigated'—possibly at a 'team-work clinic'—she has been provided with an X-ray picture book of her entire alimentary tract, her teeth have been extracted and her tonsils excised, her motions have been analysed by a biochemist and her mind by a psychoanalyst. She has

had several rest cures, she has been given prolonged courses of vaccines, of intra-muscular tonic injections, of intestinal antiseptics, and of endocrines. She has been fed on sour milk or minced beef or raw vegetables. She has experienced various forms of massage, has been subjected to the latest kinds of electrical treatment, and has had her colon repeatedly washed out at Plombières or Harrogate. In a word she has run the whole gamut of 'modern' therapy, has submitted to every stunt and conformed to every fad—but is none the better. She can escape the attentions of the fashionable surgeon only when he is grouse-shooting or salmon-fishing or leading the fashion in the Upper Engadine. She is at peace from the physician only when the latter is recruiting his exhausted energies by a short holiday at the seaside."

On examination of such a case the patient is found to be undernourished and sallow. The visceroptotic abdomen is criss-crossed by scars, the sign-manuals of the surgeons who have at one time or another conducted exploring operations into the interior. The stomach is dropped and splashy and the right kidney more or less movable. There is tenderness at various points over the colon. Constipation is obstinate and there may be mucus in the stool. Her mental make-up has now degenerated into that of 'The Mollusc,'—a character with which she will readily identify her friends but not herself. She is an expert in drugs and a connoisseur of doctors and 'specialists'. The operation habit is strong upon her, and her craving for sympathy is inflicted upon the nearest relative at hand,—sometimes an unmarried daughter, not infrequently a weelin' victim of a husband. She has become a vampire, sucking the vitality of all who come near her. Half an hour's visit to her will reduce the doctor to the consistency of chewed string, and the careful physician will avoid her like the plague.

In treatment the most essential thing is to catch the patient early. Once she has set her feet upon the slippery slope that leads to successive operations she is undone. A timely fattening cure, an efficient but simple abdominal support, regulation of the bowels by the mildest laxative—supplemented if necessary by enemas,—an abundant but non-irritating diet, and bromides for the nervous system: these are the readiest measures. On the mental side the patient should be encouraged to take up some definite occupation which will provide her with an interest outside herself.

A confirmed case however may need more drastic treatment. Many such women were cured during the war by loss of fortune or bereavement. Suffragetteism undoubtedly was the salvation of many abdominal women, but is to-day unfortunately not available as a therapeutic remedy. Marriage and the advent of a child, even an adopted one, may cure. These are the patients whom it is legitimate to see go over to Christian Science or Coué-ism without regret: they may even benefit. Of one of them the author records that when she consulted a palmist the latter looked at her hand and remarked: "If I were your husband I would take a stick to you." Unfortunately the doctor is not in as easy a position: these patients do much to injure both his peace of mind and his professional reputation. And as fewer women of the upper classes marry, or being married, have fewer and fewer children, as civilization becomes more and more complex, and as the factors which favour the chronic abdomen become more and more intense, Dr. Hutchison foresees nothing but the bleakest outlook.

A Case of Medico-Legal Interest

THE recent discussion in our columns as to the supposed dangers or otherwise of air embolism on intravenous injections lends an added interest to a medico-legal case reported to us by Dr. G. Devadhar, I.C.P. & S. K. E. Mission Hospital, Haveri, Dharwar District, who was the accused in the case in question. The facts—so far as we can gather them

from a perusal of the numerous documents submitted—were as follows —The defendant gave an intravenous injection (presumably of one of the salvarsan derivatives, and as far as we can ascertain with a 10 c.c. syringe) to a patient in hospital. About two hours later the patient somewhat unexpectedly died. The body was removed in a tonga and was made over to the relatives who lived some miles away, and they buried it. No notice of death was given to the Municipality, and—apparently—none was required, as the death had occurred in hospital.

The suspicions of the police having been aroused the body was exhumed three days after death, and a post-mortem conducted by a Dr B. This was in September, and during fairly hot weather. Dr B deposed that the body was in a state of decomposition, which, however, was not very advanced. The brains had liquefied, and the heart and lungs were decomposing. He found (a) a pin-point puncture in the region of the median basilic vein with an area of inflammatory reaction surrounding it, and shewing an ecchymosed patch when cut into, (b) blood mixed with froth was present in the right side of the heart and in the pulmonary artery. He gave it as his opinion that death was due to air embolism. On cross-examination he stated that the body was in a condition of decomposition, but not of advanced decomposition, and, as far as we can ascertain from the record, withdrew the assertion that death was due to air embolism, and admitted that it might have been due to shock or idiosyncrasy on the part of the patient to whom the drug was administered. The defendant, who claims to have administered at least 800 intravenous administrations during the past three years with no untoward effects, was discharged. From a perusal of the papers we gather that it was not so much the fact of death, as the failure to notify the death and the removal of the body, which led to the prosecution. At the same time Dr Devadhar is to be congratulated on the outcome of the case, because—obviously, we consider,—death was not due to air embolism. The lessons of the case are several, and its importance in medico-legal work considerable. We would observe —

(1) That no opinion whatever can be given as to whether death was or was not due to air embolism in a case where post-mortem decomposition has set in. Obviously such organisms as the *B. aerogenes capsulatus* may within such period cause appearances simulating those of air embolism.

(2) A bacteriological examination of the blood (here not conducted or not possible) should be made in such cases.

(3) It is most unlikely that a medical practitioner, in the habit of constantly giving intravenous injections, and using a 10 c.c. syringe could give, consciously or unconsciously, an intravenous injection of air sufficiently large to kill the patient. Experiments have shewn that to kill an ordinary sized rabbit 3 c.c. of air should be injected into the vein, and the dose to kill an ordinary sized dog has been shewn to be 40 c.c. On the other hand, whilst injection of small quantities of air into such a vein as the median basilic may be free from danger, the case may not be similar with wounds of the large veins of the base of the neck where the wounded veins would be held open by dense fascia.

(4) The chief reason for considering that death was here not due to air embolism was the two hours' delay before death occurred. Air embolism either causes immediate death within a few minutes, or at least, symptoms of immediate gravity within a few minutes of the injection.

On the information before us death would appear to have been due to the unsuspected susceptibility of the patient to the arsenical compounds. It used—once—to be a working rule to always examine the urine of a patient for albuminuria, etc., before giving an injection of the salvarsan derivatives, and the practice has much to recommend it. We sympathise with Dr Devadhar in the trouble and distress to which he has been put but the case emphasises—perhaps more than in any other

feature—the necessity for paying the utmost attention to registration at once and without delay of all deaths, whether such registration be required by law or not. The death of a patient in hospital, from whatever cause, should be immediately recorded in writing, together with all relevant information. A medical man in a difficult situation should have but one aim before him, to place the whole of his knowledge of the facts before the court,—except such as may be information of a private and confidential character from the patient concerned. In this particular instance immediate registration of the death might have saved much trouble.

A Filter-passing Micro-organism Associated with Epidemic Influenza.

By SIR SPENCER LISTER,

Research Bacteriologist, S. African Institute for Medical Research

S. African Medical Record, Nov 1922, p 434

THIS interesting paper goes to confirm the findings by Colonel M. H. Gordon and by Ohtsky and Gates of a filter-passing "micro-micro-organism" as the true causal agent of epidemic influenza. The material used for culture consisted of the naso-pharyngeal washings in warm saline from 15 selected and undoubted cases of true influenza, passed through a filter candle under a pressure of 25 lbs. the filters used being Pasteur Chamberland B, and Berkfeld V and N.

Sir Spencer Lister's account of his cultural technique will interest laboratory workers in India, in view of the importance of study in this country of the unknown viruses of such diseases as dengue and seven-day fever. The medium used was a Smith-Noguchi one, and the details of its preparation are as follows —

The preparation of this medium is tedious, and requires the utmost care to avoid the intrusion of contaminating micro-organisms. Specially long culture tubes are selected, measuring 20 cm by 1.5 cm. Sterile ascitic fluid is obtained—its titre should be between PH 7.4 and PH 7.8, a column 10 centimetres high is filled into each tube, a rabbit is then killed under anaesthesia and its kidneys are removed by lumbar incision, a fresh set of sterilized instruments is used to incise each layer of tissue overlying the kidney, the latter is seized with a pair of suitable forceps and dragged from its bed, a few snips with a pair of scissors completing the operation. After transference to a sterilized Petri dish, each kidney is divided into six pieces after stripping off the capsule. One fragment is placed at the bottom of each tube of ascitic fluid, a seal, 1 cm thick, of sterilized vaseline is superimposed, and the tube is plugged with cotton wool.

The filtrates are introduced into the tubes by means of pipettes having the distal end drawn out into long capillary tubes, the necessary pressure for expelling the fluid is provided by the use of a rubber teat. About 2 c.c. of the filtrate is used for planting out each tube, and it is deposited around the fragment of kidney at the bottom of the tube.

Cultures from five out of the fifteen cases gave positive results. In some instances the cultures gave enormous numbers of the globoid bodies. The author used 1912 Grubler's methylene blue for staining, and describes the organisms as about 0.15 μ in diameter, uniform in size, giving a peculiar impression of "hardness" when stained, and usually lying singly, but sometimes appearing in short chains. Direct sub-cultures were successful to the fourth generation. Attempts to infect volunteers by spraying with the culture fluid were not very successful, but in one instance a typical attack of influenza resulted.

Congenital Ankylostomiasis

In the *Annals of Tropical Medicine and Parasitology* for the 30th of December 1922, Drs S. Adler and E. J. Clark comment on the fact that Howard, in 1917, found

ankylostome ova in the stool of a child 14 days old, and considered that intra-uterine infection might take place.

Owing to lack of human material in Freetown, Sierra Leone, they studied this possibility with *Ankylostoma caninum* of dogs. Thirteen pups, from 2 to 15 days old, were examined. Four were found to harbour the parasite.

"It thus appears," they conclude, "that in Freetown, where intense infections with *A. caninum* are the rule in dogs, intra-uterine infection is common." With *A. ceylanicum*, however, they could find no evidence of intra-uterine infection. Infection of the foetus is possible in two ways—(1) by larvae passing through the maternal blood stream to the placenta, and through it to the foetus (2) by larvae finding their way into the peritoneal cavity of the mother, and passing through the uterine muscle to the foetus. The authors quote Yoshida's interesting finding of ankylostome larvae in the peritoneal cavity of a guinea-pig which had been placed for ten hours in a vessel containing a mixed culture of *A. caninum* and *A. ceylanicum*.

Bogus Qualifications

THE minutes of the Bombay Medical Council for the 5th of February, 1923, shew a most praiseworthy determination on the part of the Council to emulate the high standards set by the General Medical Council of the United Kingdom. The Hon Secretary of the Sind Medical Union submitted a letter on the question of bogus qualifications, which was read and approved. He instances the case of "a medical graduate of the Bombay University who has once held a temporary commission in the I.M.S., and who advertises this fact, as well as his being a specialist in venereal diseases and several others in the papers." The Council found itself helpless in the matter as this practitioner had not registered himself. Other interesting instances were a

Dr U R, M.B. (B.N.C.), who explained that the latter initials meant Bombay Homeopathic College. Dr M N, L.W.H., F.R.C. (London West Hospital, Post Graduate College), M.R.A.S. (Member of the Royal Asiatic Society, London), and Dr A, K.R. (his initials), M.D.B. (Doctor of Biochemic Medicine), L.M.H. (Licentiate of Homeopathic Medicine). Unfortunately the powers of the Council are merely advisory, but one or other of such quacks may any day place himself in a position where legal proceedings can be instituted against him under section 6 of the Indian Medical Degrees Act, No VII of 1916 in which case we trust that Government will enforce the full rigour of the law. On the eastern side of India the evil is even more rampant than in Bombay as anyone who cares to take a ten-minutes walk in Northern Calcutta will find. Thus we open an issue of a Calcutta paper to discover that "Dr" K.D.S., H.P. (New York),—(presumably an ex-house physician or homeopathic practitioner) gives hydropathic baths "Dr" N.M.,—(qualifications not stated),—who gives an address at—apparently—the S.E. corner of the "Victoria Memorial" on the maidan, cures specific diseases without injection and that "Dr" K. M., sells the royal Yakuti for princes and rich men only.

The lead given by the Bombay Medical Council is a strong one, and one which the other provincial Medical Councils would do well to follow. In India the quack flourishes as in no other country in the world. Yet—occasionally—he comes within the reach of the law, and, under such circumstances, the punishment inflicted should be an exemplary one.

Gangrene after Compound Fractures

THE *Quarterly Bulletin of the Junagadh State Hospital*, edited by Dr P. T. Kothary, L.M. & S., Chief Medical Officer, Junagadh State, for January, 1923, contains several items of interest. A special study is being made of the bacteriology of cases of conjunctivitis

occurring in the district there is a good resumé on methods adopted of treating tubercular glands and an interesting account of a case of uterine fibroid with necrosis of the tumour. The chief article in the number deals, however, with three cases of compound fracture which had previously been "treated" by local quacks. One was a compound fracture of the lower third of the left humerus, sustained seven days previously as the result of a fall from a tree. Tight bandages and some local application of a secret "remedy" had been applied, and when the patient was seen most of the upper half of the left arm was gangrenous. It proved just possible to amputate through the upper third of the bone by antero-posterior flaps. The second case was one of compound fracture of both left tibia and fibula, sustained twelve days before admission to hospital, with gangrene of the leg from the application of similar "remedies." A Stephen-Smith amputation was performed at the knee, but there was some subsequent sloughing, and convalescence took a month and a half. The third case was a compound fracture of the left humerus, sustained fifteen days previously from a fall from a tree. The limb was gangrenous to within two inches of the shoulder joint, as a result of tight bandaging and the application of secret "remedies." Amputation through the shoulder joint was carried out by Spence's method, and the patient made a sound and rapid recovery. Dr Kothary always gives injections of a mixed streptococcus and *B. proteus* vaccine in such cases and comments on the appalling results of tight bandaging and secret "remedies." It would be interesting to discover the rationale for the use of a tight bandage,—possibly to check hæmorrhage,—possibly with a view to deliberately inducing gangrene. Until the law in India permits of such quacks being prosecuted, and until existing laws are enforced, the Indian patient who falls into the hands of such "practitioners" will continue to suffer.

The two Lines of attack in the treatment of Amœbiasis

By PAUL RAVAUT (Paris)

DR. RAVAUT discusses the treatment of amœbiasis in the October number of the *Revue Pratique des Maladies des Pays Chauds*. He points out that there are certain cases which are best treated by intravenous and subcutaneous injections, while others respond better to treatment by the mouth.

He considers emetine and novarsenobenzol to be the most active agents available for the cure of amœbiasis and he thinks that the combination of these two drugs should represent the standard line of treatment. He insists on a thorough and systematic course of medication from the beginning as he believes that insufficient treatment may actually do harm just as it does in syphilis.

His cure consists in ten injections of novarsenobenzol in doses of 0.3 gramme every four days. After the first, second, third, seventh, eighth, and ninth of these injections he gives a course of three injections of emetine in doses of 4 centigrammes on the first day followed by 6 and 8 centigrammes on the second and third days respectively. In all, eighteen injections of emetine are given during the forty days course of treatment.

The dose of emetine may be increased to a slight extent in the case of robust patients, but it is necessary to guard against over treatment with the drug.

A second course of treatment of shorter duration should be given after two or three months even if no amœbæ or cysts are found in the stools, or instead the oral treatment may be adopted.

A similar course of treatment is advocated in amœbic hepatitis and liver abscess of small size, and even in cases in which surgical intervention is needed the treatment should also be given to cut short the period of suppuration.

Chauffard points out that when the pus obtained by aspiration is hæmorrhagic the abscess is active and is

be harmful. The inquiry showed that the infection must have been in the pot when it left the factory, but it failed to show how or where the infection had taken place.

Mr Bruce White, B.Sc., of Bristol, working for the Scottish Board of Health found *Bacillus botulinus* and its toxin in the remains of one of the pots of wild-duck paste.

Human Carriers of Plague Bacilli.

MARCEL LEGER and BAURY in the *Bulletin de la Societe de Pathologie Exotique* of January 1923 discuss a case in which plague bacilli have been isolated from a healthy human carrier.

Early in September last plague bacilli were found in smears from gland juice from natives of Dakkar who had been in intimate contact with plague patients but who showed no signs of plague themselves.

The bacilli showed the cultural characters of plague bacilli, they were highly virulent for laboratory animals, it was also found that susceptible animals were capable of being immunised against the bacilli by previous injections of anti-plague serum.

No essential difference could be established between the strain obtained from the healthy carrier and that obtained from a person suffering from acute plague, so that there was no question of an attenuated germ such as had previously been described in the rats of Paris.

Reviews.

KALA-AZAR, A HANDBOOK FOR STUDENTS AND PRACTITIONERS—By L. E. Napier, M.R.C.S., L.R.C.P., and E. Muir, M.D., F.R.C.S. (Edin.) 1923. Oxford University Press, London, Bombay, Calcutta, Madras. 152 pp., 15 illustrations. Rs. 6. Obtainable from Messrs. Thacker, Spink & Co., Calcutta.

READERS of this journal will, many of them, be familiar with Dr Muir's "Handbook on Kala-Azar." The present volume, however, is very different. It is not a second edition of Dr Muir's former book, but a completely new book, written by Dr Napier, who is in charge of the kala-azar research work at the Calcutta School of Tropical Medicine, and by Dr Muir, whose clinical experience of the disease at Khulna and in Bengal is unique.

The book presents to the student and to the medical practitioner the whole of the information about kala-azar in an exceptionally clear and lucid style, and is well illustrated. Successive chapters deal with epidemiology, symptomatology, etiology, pathology and laboratory technique, diagnosis and treatment with an appendix shewing typical temperature charts and the distribution of the disease in Bengal, specimen case sheet cards, and a full bibliography and index. The book is thus replete with information and is thoroughly up-to-date. It gives the practitioner everything that he wishes to know, from both clinical and laboratory points of view, and supplies him with an answer to any enquiry regarding the disease. Plate II shewing the distribution of kala-azar in India, is one whose study will well repay attention.

Turning to individual sections of the book the brief historical introduction is of interest, since kala-azar has almost certainly been endemic in Bengal since 1835 or earlier. The discussion on possible modes of transmission is a careful, well-balanced and discreet bit of writing. The chapter on symptomatology is full and detailed and includes all essential features of the disease and of especial value is its recognition of three different types of onset of the initial fever, a paratyphoid-like type, a malaria-like type, and an

insidious type. Under pathology and laboratory technique full instructions are given details of such matters as the proper method of making Leishman's stain, the full technique for spleen puncture and for peripheral blood culture, and for the preparation of N.N.N. and of Row's media being given. Serological tests are fully dealt with and here Dr Napier's great authority lends a special value to a full and detailed account and discussion of the aldehyde test,—a subject upon which the general practitioner's knowledge is all too apt to be confused and hazy. With regard to treatment the authors still regard the intravenous administration of sodium antimony tartrate as the sheet anchor, but discuss other antimony compounds. Here the instructions given are very detailed, it is essential to use only freshly prepared solutions, dosage for different ages is discussed, technique, complications which may arise during treatment, and subsidiary treatment, such as the use of T.C.C.O. are all carefully dealt with. The practitioner is always faced in treating a case of kala-azar with the necessity for some practical and reliable clinical test for cure he will find this difficult question most ably dealt with, and will find clearly laid down rules which he can follow on pp 125 to 128. Also the section on the intramuscular use of sodium antimony tartrate in young children and in others where intravenous therapy is either impossible or is contra-indicated will be welcomed by many readers.

Finally the excellent bibliography lends added value to the book, whilst the authors do not omit to discuss such problems as the future of antimony therapy and the many unsolved problems associated with the disease.

We would recommend this admirable little volume, issued at a price well within the means of all, to every medical practitioner who has to deal with kala-azar cases, and—above all—to those working in the endemic and epidemic areas. On its own merits we feel assured that the book will be most heartily welcomed by many workers in Assam, Bengal and Madras. There are a few minor matters in which we trust the second edition will improve upon the first—for instance we do not like the jaundiced individual in the frontispiece, although the too yellow colouring is clearly an error of printing; also the very heavy type used at the head of the chapters is perhaps a little too emphatic. On the other hand the majority of the photographs and illustrations are admirable. The whole volume has been most carefully compiled, and is authoritative and very well put together and printed.

INJURY, RECOVERY AND DEATH.—By W. J. V. Osterhout, Ph.D. J. B. Lippincott Company, Philadelphia and London, 1922. Pp. 259, with 96 illustrations. Price, 10/6 net.

THIS volume is one of the splendid set of monographs on experimental biology now being published by the J. B. Lippincott Company under the editorship of Dr J. Loeb, Dr T. H. Morgan, and Dr Osterhout, the author of the current volume. The days have now passed when "biology" meant playing about with pithed frogs in a laboratory, and both experimental biology and general physiology tend to become more and more highly specialised subjects studied with the finest of apparatus, and from a mathematical and quantitative rather than from a purely descriptive and speculative point of view. The results of such methods cannot fail in the long run to exert a profound influence upon medicine. A generation ago the medical profession would have resented the intrusion of chemists, biochemists, mathematicians, and experimental biologists into a field which was regarded as a strict preserve to-day, although the profession remains in many ways an antiquated one, practising out-of-date methods, yet we are beginning to realise that mere clinical data must be supplemented by experimental, quantitative and statistical enquiries.

Dr Osterhout is Professor of Botany at Harvard University, and his volume deals chiefly with a study of the mechanism of the processes of injury, recovery

and death in plants under experimental conditions. Recovery from an injury is usually considered to be complete the truth however is that it is rarely, if ever so a smaller or greater percentage loss of efficiency results, and can only be assessed by quantitative and experimental study. In any real study of biological problems the exact methods of physics, chemistry and mathematics must be used.

After dealing with methods and newly devised apparatus for the measurement of electrical conductivity in plants the author proceeds to a study of the mechanism of death. Toxic substances may affect the conductivity of a plant such as *Lammaria* in two ways they may either cause a progressive loss of resistance, ending in death or they may produce a rise in resistance, followed by a fall which continues until the death point is reached. The first group includes the salts of the monovalent metals, and the author establishes an experimental curve and equation which enable him to predict, to within a standard deviation of less than 10 per cent. of the mean, the chances of death on exposing *Lammaria* for different periods of time to a solution of 0.52 M sodium chloride. It is obvious that such curves, which will enable one to predict the course of vital processes, must mean a tremendous advance in the study of life processes.

Turning next to an experimental study of injury and recovery the author shews that the protoplasm of *Lammaria* is able to withstand violent alterations of conductivity and yet recover. Fluctuations in permeability may enable the cell to withstand injury, and may constitute an important element in the control of cell metabolism. A fall of resistance may be taken to indicate injury, and the amount of such fall may be taken as a measure of the amount of injury. Recovery is not really the reversal of the reaction which produces injury. recovery and injury are irreversible reactions which differ only in the relative speed at which certain reactions take place. As Loeb has emphasised catenary reactions play a large part in life phenomena, and a substance which acts as a member of such a catenary system, even although present in the organism in only minute amounts, may play a large part in the control of cell metabolism. If such a system be present in the ovum, we can picture all subsequent life developments as due to this system, without the introduction of any new reactions, development, senescence and death being due to changes in the rate of the reactions concerned. The fundamental life processes appear to obey the laws of chemical dynamics.

Loeb and many other writers have put forward theories to explain the antagonistic action of different substances contained within cell protoplasm, NaCl and CaCl₂ for example. The author shews that whereas it has previously been impossible to predict what substances will be antagonistic to one another, they may be divided into two groups those which cause an increase in cell conductivity, and those which cause a decrease in conductivity (followed by an increase). The two groups function as antagonists to one another, to some extent their degree of antagonism can be predicted, and the permeability of the cell membrane appears to depend rather upon its proteid constituents rather than upon its lipid constituents, as usually believed.

The chapter on anaesthesia is one of special interest to medical readers. *Lammaria* placed in sea water containing ether at first shews increased electrical resistance, followed by a fall and anaesthesia is associated with a reversible decrease of permeability of the cell membrane. Chloroform gave similar results, but alcohol gave results of an entirely different order. The increase of permeability, which is irreversible with ether, chloroform and chloral, is reversible with alcohol. Anaesthetics on the whole produce a marked decrease in cell permeability, but injury does not result unless the concentration is too high. It is generally held that cell membranes are of lipid character chemically, and that anaesthetics are effective in proportion to their solubility in lipoids. But this may not be the case the effectiveness of a dye in

colouring the cell depends, not upon its rate of penetration, but upon its ability to accumulate within the cell by combining with substances in the protoplasm. With anaesthetics lipoids in the interior of the cell may be the determining factor.

Dr Osterhout's book is a most valuable contribution to the solution of the inner mechanism of life processes. He shews how changes in permeability may be followed by determining electrical conductivity, and how a study of such changes may enable one to treat such conceptions as vitality, injury, recovery and death in a quantitative manner and to predict the behaviour of tissues. In America at least the use by experimental biologists of statistical and quantitative methods is leading to most fruitful results some day perhaps the medical profession will realise the importance of the introduction of similar methods in medicine.

OFFICIAL HISTORY OF THE GREAT WAR.

—Medical Services Diseases of the War, Vol II Edited by Major-General Sir W. G. Macpherson, Sir W. P. Herringham, Colonel T R Elliott, and Lieutenant-Colonel A. Balfour. H M Stationery Office, 1923 631 pp, 7 colour plates, maps and illustrations. Price, 26 net. Obtainable from Messrs. Thacker, Spink and Co, Calcutta: Messrs. Thacker and Co, Bombay, and all agents for the sale of Government publications.

This volume is in continuation of Vol I which was reviewed in the *Indian Medical Gazette* for January, 1923, p 43 and, whilst the subjects dealt with are of more military and less civilian interest, the volume is one which every medical officer should study and which every reader will deeply appreciate. Again the volume is based upon an immense statistical basis, is profusely illustrated, has splendid colour plates, and provides information nowhere else accessible.

Chapter I deals with neurasthenia and war neuroses, and is by Capt W Johnson, V.C., R.A.M.C. and Lieutenant-Col R Rows, C.B.E. R.A.M.C. (T.C.) An analysis of the cases at Boulogne shews that 7 to 10 per cent of all officers, and 3 to 4 per cent of other ranks admitted were suffering from these symptoms, and that 50 per cent of the cases had broken down before the end of sixth months of exposure to shell fire. In 1921 there were still 65,000 men receiving pensions for various degrees of disablement from these causes. The problem first became acute during the battle of the Somme in July, 1916. The authors, whilst commenting on the not unnatural army point of view that the majority of these cases were shirkers, shew that the cases included only a very small proportion of malingerers. The introduction of the term "shell-shock," they regard as most unfortunate the patient gaining the idea that his condition was grave and incurable. The organisation of army field and home centres for nervous disorders is described.

Post-mortem material for a study of such cases was scanty but in only 25 per cent was there evidence of organic lesions of the CNS. The cases grouped themselves into four groups (a) simple exhaustion, (b) neurasthenia and anxiety, (c) hysterical states, and (d) confusional states, either mild or severe.

In the cases of simple exhaustion psychic irritability was a prominent feature men who had preserved self-control and who had been fine soldiers for months on end breaking down into a condition of irritability, and loss of emotional control. Some shook all over for weeks on end, even when in bed. Only 10 per cent of cases required to be evacuated to England, and it was found that simple private conversation with the invalids by medical officers with special training and tact was a most useful measure. Many of the men not unnaturally loathed the idea of returning to the firing line others were afraid of being written down as cowards often a spell of duty in the base areas cured the case. The cure for war neuroses lies in improved morale and in pre-war training.

Skin diseases are dealt with by Lt-Col A M Gray, Major J A Manifold and Major T J Mitchell, in Chapter 2. In an army in the field such conditions are of supreme importance in one army in the later stages of the war no less than 90 per cent of admissions to hospital were from such causes. Scabies was responsible for 64.9 per cent of all cases of pyoderma, and shewed a special association with boils. The incidence of scabies was totally unlike that of pediculosis in fact scabies was especially prevalent among drafts newly out from home and among men coming from base camps to the front line. To some extent the scabies incidence followed that of venereal diseases, and troops near civilian centres shewed high incidence. The blankets of mangy horses were found to be a prevalent source of infection. By way of treatment sulphur triumphed over all other measures. The method of use was as follows—On the first day the patient was thoroughly rubbed with soft soap for 15 minutes and lay in a hot bath for 20 minutes, during the last five of which the infected areas were gently scrubbed with a soft brush, the object of these measures being to open up burrows and expose the *Acari* and ova. After drying a liberal quantity of B.P. sulphur ointment was then rubbed into the whole body below the neck, with special attention to the hands, feet and genital areas. Theunction was repeated on the 2nd and 3rd days. On the 4th day, but not before a second bath was given, and the patient supplied with an entirely new outfit of clean clothes and bedding, even such articles as wrist straps and the cords of identity discs requiring to be disinfected. If dermatitis occurred dusting powders or simple ointments were applied. An early case could thus be cleared in 4 days, but the severe type met with in France on an average took 31.7 days to eradicate.

In pediculosis the only species of importance was *P. vestimentorum*. The distribution of pediculus bites is entirely different from that in scabies. The three most affected areas in pediculosis were (a) the shoulder area, (b) the waist area and (c) the puttee area, which in mounted troops might include areas up to the middle of the thigh. In scabies the whole of the back escapes, except for the lower part of the buttocks, whereas in pediculosis this area is often severely affected. With regard to treatment the first essential is to remove the cause: once that is done the mild cases quickly recover on lead or calamine lotion; the cases with septic lesions however are apt to prove very troublesome.

In dealing with oriental sore Major T J Mitchell does not bring forward much that is new. In Mesopotamia at least 10,000 cases must have occurred, many of them being treated regimentally. The many different lines of treatment adopted shew that there is still far from unanimity on this point. In No 105 Combined Field Ambulance the sores were first dusted with calomel, then after 24 to 48 hours dressed with black wash, followed by blue ointment when healing commenced. When healthy granulations appeared the sore was covered with a clean, polished lead plate, which was sterilised and changed daily. 65 per cent of 341 cases were cured within a month. Tincture of iodine was found to be useless. Ormerod found that many cases could be cured in 27 days by X-rays, but the tubes deteriorated in the climate of Mesopotamia, and electric fans had to be kept playing on the tubes to cool them whilst working. The same diversity of treatment also applied to Ulcus tropicum. In dhobi itch, chrysophanic acid ointment, 20 grains to the oz of vaseline, rubbed in twice a day till erythema appears at the growing edge is recommended.

In Chapter 3 Colonel L W Harrison deals with venereal diseases, and in 41 pages summarises his enormous experience and provides an authoritative and important account of these diseases as they affected the armies in France. From 1914 to November 1918 and the Armistice the approximate number of cases dealt with was 400,000, of which gonorrhœa contributed 66 per cent and syphilis 24 per cent. The incidence was very much heavier among the Colonial and Dominion troops

than among home troops. The reasons are not far to seek: the former when on leave drifted to London and had money to burn, the latter as a rule went home to their families and were paid on a less lavish scale. An analysis of some thousands of cases among British troops shewed that over 60 per cent of infections resulted from intercourse with women who were not professional prostitutes. An account is given of the vigorous measures which converted Port Said from a hot bed of infection into an area no worse than any other. In 1915 the heavy incidence of venereal diseases at Havre led to the inclusion of observed *maisons de tolerance* within bounds: within 57 weeks 171,000 men had visited these houses but only 243 stated that they had been infected within them. In April 1918 the pressure of public opinion led to the putting of such houses out of bounds, despite the apparently general consensus of opinion that they were less harmful than other and uncontrolled factors. With regard to personal disinfection it is difficult to establish its value or otherwise. The establishment of disinfection stations with disinfection by skilled attendants seemed to yield far better results, and was especially adopted by the Australian forces both in France and in London. The abortive treatment of gonorrhœa was eminently successful, of 7,366 Australian soldiers treated by the abortive method in a year 5,350 were cured without admission to hospital.

Very early in the war it became apparent that the venereal disease problem could not be properly tackled unless special hospitals and special personnel were provided to attempt treatment of venereal cases as part of general hospital routine and by men who were not specially qualified in this line was hopeless. The account of the organisation of No 9 Stationary Hospital shews how much the establishment of such special centres throughout France and Britain saved in the way of invaliding and loss of fighting strength.

In treating syphilis the difficulty of ensuring that the patient was radically cured was increased by the urgent necessity for getting the patient back to duty at the earliest possible moment. The standard courses adopted hence varied considerably at different periods. In 1916 the standard course was 28 gms of salvarsan or its equivalent in 50 days but cases and outbreaks of dermatitis and jaundice shewed that this was probably too intensive and the standard course was later modified to 26 gms in 56 days together with mercurial treatment. Intramine and ferrivine introduced by McDonagh, were tried but proved disappointing. In the treatment of gonorrhœa Colonel Harrison still confesses that the position is far from satisfactory. There is no specific, and neither the mercurial derivatives nor colossal manganese appear to improve the orthodox treatment and its results. Chapter 3 is one which should be read and studied by every medical officer. Among other conclusions Colonel Harrison insists on the importance of making preparations before war occurs, on the value of prophylaxis by skilled disinfection, the abortive treatment of gonorrhœa and the danger of the policy of leaving such cases to travel untreated for days down long lines of communication and—above all,—on the necessity for the training of special personnel to deal with these diseases.

Chapters 4, 5 and 6 deal with the medical aspects of aviation problems and are by Lt-Col J L Birley, Lt-Col A P Bowdler, Wing Commander Martin W Flack, and C J Stewart R.A.F. Here the reader will find a mine of information on a new but increasingly important subject. The examination of candidates for flying must of necessity be a severe one even with the utmost care the number of fatal accidents which occurred during training in the war was roughly one per 1000 flying hours. The modern aeroplane has a landing speed of not less than 40 miles an hour and it is this fact above all others, which imposes strain on the pilot. Early in the war it became apparent that a special medical examining board was essential, and this was established. The examination in general consisted

of (a) a general examination by a surgeon, including tests for visual acuity and colour vision, (b) a medical examination, including an enquiry into personal and family history, and breath-holding and pulse-after-exertion tests, (c) an examination of nose, ear throat, buccal cavity and Eustachian tubes, including the tests for self balancing with eyes closed, and the test with the balancing rod on a board,—the board having to be raised to shoulder level in turn with each hand and with eyes open first and then closed, without upsetting the rod standing on it, (d) finally a general assessment by an officer with expert flying and medical experience, in which *inter alia* a private chat with the candidate would often determine in the assessor's opinion his real fitness for flying or otherwise. Chapters 4 and 5 detail the special and general tests employed and emphasise that whereas in America such tests as the Barany chair in which the candidate can be rotated and a labyrinthine test applied are much relied upon, in Great Britain such tests were reserved for special cases and more reliance placed on the more general examinations and the candidate's previous history in games, sports, etc.

For flying at high altitudes it soon became apparent that oxygen administration was necessary, and chapter 6 gives an exceedingly interesting account of the tremendous strides made in this subject during the war. As usual the Germans started it the British were at first compelled to make makeshift use of existing apparatus for oxygen administration as used in general medical practice but finally the specially devised British apparatus was far and away better than anything made by the Germans. The use of compressed gas gave way to specially designed 20 litre liquid oxygen containers, the difficulties of freezing of mouth pieces and masks were overcome, oxygen was more and more freely used and at lower and lower altitudes, and it is now clear that such administration may vastly improve flying efficiency and diminish flying strain.

The most interesting portions of this volume however are chapters 7 to 17 on the medical aspects of gas warfare. Here there is a wealth of information of immense importance to military medical officers. The principal contributors are Lt.-Col. C. G. Douglas, Colonel T. R. Elliott, Lt.-Col. D. D. Logan, and Colonel A. B. Soltan. Whatever the influence of gas on morale,—and there can be no gainsaying this point,—it is doubtful whether, in the end gas accomplished anything like what was hoped for it by the Germans. And chapter 9 shews that again, although at first caught napping, the retaliatory measures were such that in 1917-18 captured German operation orders were filled with alarm at the extensive and successful use of gas by the British and French, and that the enemy were outfought and beaten in their own horrible inventions.

Chapters 7 to 17 are too long for adequate review, but certain points may be noted. Germany started the war with every facility for extensive gas production, the Allies with no facilities at all. Yet in 1917 when the Germans at their biggest output were manufacturing 3,000 tons of warfare gases per month, the British turned out 18,500 tons in the year and, as the wind was favourable for the greater portion of the year to the Allies rather than to the enemy, the latter suffered most.

Throughout the gas warfare the medical services were hampered by the need for secrecy. Treatment often had to be empirical, as the nature of the gases employed was frequently changed and the information acquired with regard to their composition was only slowly diffused. The gases employed by the enemy fell into several groups (a) acute lung irritants, (b) lachrymators, (c) paralytics with direct action on inhalation on the CNS, (d) sternutators, which acted on eyes, nose and upper respiratory passages, and (e) vesicants. At first the enemy relied on cloud attacks, but the limitations of this method were soon realised and gas shell came into general use. Most of the gases were employed in liquid, even in solid form, and did not vaporise until emitted from either the container

or shell used. Often the bombardments were of mixed character thus mustard gas would first be used in order that the troops shelled would not become aware of it till too late, and this would be followed up by a bombardment with acute lung irritant gases to catch those who had not put on respirators. The extent to which the Germans relied on gas is shown by diagrams of their principal gas bombardments, a study of which shews how different gases were used to shell different areas according to whether it was or was not desired to occupy them, and by the proportions of different types of ammunition in captured enemy dumps in 1918. *cq* H E and Shrapnel 60 per cent, blue cross gas 30 per cent, other gas shells 10 per cent. Finally the British devised hurricane gas bombardments from Stokes' trench mortars which considerably surpassed the effects of long range gas shelling by artillery.

The history of the first use of gas by the Germans and the immediate organisation of a defensive corps in England, comprising the finest of chemical intellect in the country, is too well known to need repetition. The ultimate anti-gas organisation constituted a separate service with its own G.H.Q. The 23rd April, 1915, the day after the first German gas attack,—a cloud attack with chlorine on the Ypres salient,—found the troops being supplied with handkerchiefs and sodium bicarbonate solution as a temporary protection. The veil respirator followed then the "hypo" smoke helmet, all of them temporary measures. The introduction of lachrymator gases by the Germans necessitated the addition of goggles, and as the Germans were suspected to be about to use phosgene in June 1915, this was met by the use of sodium phenate in the helmet. The 'P, PH and PGH helmets' followed. Mr Lambert at Oxford University produced granules of lime and sodium permanganate, and the use of box respirators followed, the small box respirator of the British and the French Tissot masks following. Collective protection against gas effects in trenches and dug outs by screening fans, etc. was also used.

Chapter 11 deals with the lung irritant gases, of which chlorine was the first introduced. Death would occur either from acute oedema of the lungs, with rupture of alveoli and interstitial emphysema, or from delayed broncho-pneumonia. Phosgene and chloropicrin vapour were introduced later. The beautiful colour plates throughout chapters 11 and 12 here increase the very great value of the accounts of the pathology, symptomatology and treatment of these conditions. Rest, warmth, oxygen and venesection summarise the treatment found to be most successful, and the importance of not moving gas casualties down lines of communication until it is clear what gas has been employed and what the prognosis will be to the patient is emphasised.

Of the vesicants mustard gas was the one most freely employed, the chief effects being acute inflammation of the whole of the respiratory tract from nares to bronchioles. Plate 6, shewing general erythema of the skin after exposure to yellow cross, and Plate 7—a most striking case of blistering of the skin of the buttocks of a man who sat down on ground contaminated with mustard gas, and who was severely blistered through his trousers,—well convey the acute lesions which follow such gases. Of the sensory irritants, such as HCN and arsenical derivatives, it is to be noted that such gases may poison the water of shell holes, etc.

Chapter 15 deals with poisonous gases not used for offensive purposes, chapter 16 with the general measures for handling gas casualties, and chapter 17 with invalidism from gas poisoning. Of the accidental gases of warfare carbon monoxide stands pre-eminent. The organisation of forward and base gas centres is detailed from vesicant gases, a not unimportant point. Of a total of 180,983 gas casualties in France during the war 6,062 died, and of approximately 150,000 gas casualties which survived being gassed on one or more occasions, in 1920 only 19,000 or approximately 12 per cent. were in receipt of pensions for gas disabilities. Gas poisoning was responsible for only some 2 per cent. of the

disabilities persisting after the war, and gas as a whole, proved far less deadly than the enemy had hoped.

Of the remaining chapters in this volume No 18 is an interesting account of the special medical problems in tanks by Lt-Col C G Douglas. Rise of body temperature, oxygen deficit and CO poisoning are the chief difficulties in action. Chapters 19, 20, and 21 by Lt-Col D Dale Logan deal with gas poisoning in mine warfare, carbon monoxide poisoning in mines, and mine rescue work. Here again a splendid and specialised organisation grew up to deal with these special problems, and the method of establishing mine rescue stations, the training of mine rescue squads, the special mine stretcher, the "Novita" oxygen reviving apparatus and the "Proto" and "Salvus" rescue apparatus, with asbestos hood and apron are described.

Volume II of this series is one which should be studied by every administrative medical officer and by every military medical officer. It adds one more to this splendid series of volumes, volumes which present to the reader in readable and authoritative form the medical, surgical and sanitary lessons of the war lessons, which when learnt, may well revolutionise military medicine in response to the ever changing characters of modern warfare, and which are not without their interest and importance also for the civil medical practitioner.

THE MEDICAL ANNUAL, 1923. Forty-First year. John Wright and Sons, Ltd, Bristol. 600 plus xvi plus 143 pp. Profusely Illustrated. Price 20/-.

THE Medical Annual for 1923 is a volume which no practising general practitioner can afford to be without. It is particularly rich in articles of practical clinical value. Among many other articles perhaps that by Sir W I de C Wheeler on "General surgical treatment" is the most interesting. He emphasises the necessity for team work, the use of written instructions to sisters in charge of the theatre and wards and discusses the evils of a too warm theatre and of unnecessary trauma. Mr Thurstan Holland deals with radiotherapy and discusses the different advantages of deep therapy and of the older method of repeated small doses. Mr E W Hey Groves deals fully with the surgery of bones and joints including a very careful discussion of methods in congenital dislocation of the hip. The section on heart disease is one specially written by several distinguished French physicians with the co-operation of Dr Carey Coombs. Photometry is dealt with, and of special value is the discussion on arterial tension and the value of a salt-free diet in such conditions. Of special value is the section on surgery of the thyroid. No less than 239 different drugs have been recommended in hyperthyroidism, a sufficient indication of the valuelessness of most of them.

With regard to stricture of the rectum Mr Lockhart Mummery points out that the condition is *not* always or even usually due to syphilis. The articles on gonorrhoea and syphilis are by Colonel L W Harrison and therefore represent the very latest and best of British practice and teaching. If permanganate is to be given up for irrigation in the former disease, the author considers that acriflavine is the best alternative. Under syphilis there are full discussions of the question of immunity, diagnosis by cutaneous and other clinical tests, cold fixation and other modifications of the Wassermann reaction, cardiac and gastric syphilis, preparations for intramuscular use in syphilis, the toxic effects of the arsenobenzol compounds, and syphilis of the CNS.

Skin diseases are dealt with by Dr Graham Little, the article on alopecia being especially good and new methods of dealing with furunculosis given. Dr O C Gruner contributes a full and detailed review of basal metabolism, its methods of estimation and clinical applications. In the articles on mental disease and psychological medicine the reader will note the present day tendency to get away from physiogenic towards

psychogenic theories of the etiology of mental diseases. Under epilepsy luminal therapy is fully considered. Dr R Hutchison deals fully with the present position of gastric analysis and with gastric and duodenal ulcers. The use of caustic soda in both conditions appears to point to an important advance in treatment.

The sections on eye diseases are by Lt-Col A E J Lister, F.R.S. (retd). The use of saturated mag sulphate solution in corneal states as an eye bath is dealt with and he speaks highly of xeroform in corneal ulcers. Attention is drawn to the harm which results from too frequent repetition of local remedies, and under refraction Maddox's new tests for astigmatism are given.

Disorders of pregnancy by Dr W E Fothergill is an exceptionally useful article and includes a review of Dr T W Eden's analysis of 2,005 cases of eclampsia and their treatment. Under vaccination Dr J D Rolleston gives an account of the results of vaccination in the Philippines, the disease used to cause a death roll of 40,000 per annum prior to the introduction of vaccination, but in Manila with a population of over 250,000 after the introduction of vaccination not one death from small-pox occurred in seven years. Dr J Priestley discusses cancer and its prevention over the age of 40, one in 8 females and one in 14 males die from cancer, and the disease appears to increase proportionately with civilization especially white civilization. Of other exceptionally able articles that by Dr Wyllis Andrews on the surgical procedures in gastric and duodenal ulcers, also his article on the surgery of the appendix—which comments on the present day tendency to too frequent operation—Dr Arthur Latham's full review of the subject of bronchial asthma, and Dr J D Comrie's able full and detailed review of recent advances in our knowledge of the causes of and treatment of nephritis, are worthy of careful study and reading. Under X-ray diagnosis Mr Thurstan Holland gives striking plates of results by new methods and improved technique.

The sections on tropical diseases are by Sir Leonard Rogers and here the practitioner in the tropics will find a wealth of recent information especially in the articles on ankylostomiasis and yaws. The recent literature on bacillary dysentery is well summarised. Even though he take in no other medical book or journal, the general practitioner will find in the Medical Annual a mass of accurate and well summarised information nowhere else accessible in so ready and so useful a form. The 1923 volume does everything to maintain the very high standard of this historical annual British publication whilst its low price brings the latest and most up-to-date information within the reach of every practitioner.

MONTAIGNE AND MEDICINE—By James Spottiswoode Taylor, M.D. Published by Paul B. Hoeber, New York, 1922. 237 pp. 32 Illustrations, \$ 3.75.

THE medical practitioner who does not read medical history obtains but a very partial view of his profession. In this little volume—the illustrations to which alone constitute a delightful picture gallery,—Commander Taylor U.S.N. and member of the Société Française d'Histoire de la Médecine, gives a delightful and often whimsical account of the great essayist's views on the profession of medicine. Montaigne's study was that of mankind itself, with himself as the readiest subject for practical dissection. His style is with that of all the greatest of philosophers, was remarkable for its simplicity and directness.

Montaigne 1533 to 1592, is a philosopher whose writings will always interest the physician. He was for many years a sufferer from renal calculus, a malady which the medical profession could not alleviate but which he bore with remarkable fortitude, often riding 20 or 30 miles a day despite the agony of renal colic and whimsically giving thanks that at least his illness was one of those in which Nature kindly permitted long

spells of freedom from pain and interludes of comparatively robust health. In analyzing human thought and conduct he was a model for the physician who studies pathology and symptoms, for he held everything *sub judice*, was unwilling to speak with finality on the thousand and one things which he observed and studied, and has been described by Lamartine as 'one of the two great republicans of French thought'.

The reader of this delightful little volume will find everywhere matter of interest and fascination. Montaigne's father a wealthy burgher of middle class French stock held decided views on the upbringing of children—for instance that they should not be rudely awakened from sleep but gently aroused to the strains of music. Of marriage Montaigne held that the true basis should be mutual respect and identity of interests, of eating that meals were dull affairs save in pleasant company of sleeping that a tester and bed curtains were essential to comfort and that the German stove and a warm bedroom were to be highly commended. He remarks quaintly that scratching the head is likely to provoke thought, and that it is one of Nature's sweetest gratifications. The author gives a charming account of Montaigne's celebrated tower in its third storey the philosopher could lie comfortably a bed of mornings listening to the strains of the Mass below the library with its thousand volumes and its rafters covered with quotations from the great philosophers was his favourite retreat.

Of the quacks of the day who infested France Montaigne has left an interesting account—especially in his story of the woman with a sore throat who was cured by an ingenious fellow who produced a crooked pin which he claimed to have removed from her throat but which Montaigne saw him remove from his doublet. Of the virtue of self-control he was himself a noble example yet he tasted with a fastidious taste the pleasures of life and described them with a Rabelaisian touch. But although to quote Carlyle, his religion was at best an anxious wish a great Perhaps, yet throughout his writings there shines a lofty and unconquerable spirit of the education of children, he wrote 'Tis not the soul tis not a body that we are training up but a man, and we ought not to divide him. What strikes the reader more than anything else perhaps is his nicety of taste fog and smoke he abhorred though fond of the hunt he could not bear to be in at the death he preferred a clean napkin at each course of a meal and on his travels at Ferrara and Urbino he records his horror of a sweetened and thick wine.

When such a philosopher suffering from an incurable malady armed with a whimsical and yet kindly pen, comes to set down what he thought of the crude physicians of his day his writings become of intense interest, even to present day readers. He professed a horror of physicians he ridiculed their foibles,—'a physician,' he writes 'takes no pleasure in the health even of his friends', yet his touch was kindly he admitted the gold within the dross, he was a true friend of medicine, and when ill little as he expected from them he still called in the doctors. His writings are full of medical and anatomical analogies, and much of his writings are, not unnaturally, concerned with the tortures inflicted upon him by his ureters.

Throughout Commander Taylor's book we get frequent touches which help to bring the great essayist before us in intimate, personal detail. He considered the pocket handkerchief a most insanitary device odours he considered of great importance in comfortable living the great things in the world, he thought, belonged to those under thirty and at forty he thought that a man should mend his ways, if he would seek health and a happy old age. Of the violent purgatives in use in his day he considered that they did more harm than good and with regard to prescription writing, he remarks 'who ever saw one physician approve of another's prescription, without taking something away from it or adding something to it?' Yet,

he writes, 'I honour physicians, not for necessity, but for having known many very good men of that profession and most worthy to be believed,' although of their methods and ignorance he is impatient for 'some they send to vows and miracles, and others to hot baths and waters, whilst the last device is 'to send us to the better air of some other country'.

As a patient Montaigne behaved himself bravely. Though tortured with calculus and gout he can yet pride himself that these are diseases to be proud of. To give way to pain, he insists, is cowardice. The cure for introspection is to go on one's travels and observe mankind and all his works. Gardens and fountains, the beauty of mountain and cascade, the grandeur of colonnade and ancient citadel,—these are for him the cure for an ailing spirit he is equally at home when banquetting with a cardinal or dancing with peasants. He loves a pretty face and, to his amazement, finds Venice disappointing in this respect. Montaigne's travels are, of course, celebrated, and he is a model for all who would shake off insularity. Everywhere he finds matters of interest a ceremony of circumcision of which he gives a detailed account, the tortures of the flagellants, the gardens and vineyards of Rome, the miracle-working shrine of Loreto, conversations with the learned professors of Pisa, the baths of Viterbo. In 1580 he returned home to France, and died in 1592 after several severe attacks of hæmaturia and three days of aphonia.

Commander Taylor's book will charm its readers it is a fascinating study of an immortal subject.

PROTISTS AND DISEASE—By J. Jackson Clarke, M.B., Lond., F.R.C.S. Baillière, Tindall and Cox, London 1922. 229 pp. With 61 illustrations. Price, 15s net.

THERE may be more things in Heaven and earth than are dreamt of in the philosophies, but, frankly, we do not believe that Mr Jackson Clarke's *Plasmodium* are among them. This is the sixth of a series of books by this author devoted to championing his claim to have discovered the parasitic micro-organisms of mollusca contagiosa, syphilis, cancer, rabies, small-pox, carcinoma (or at least "cancer"), and a few other diseased conditions. If imagination has run riot among the *Entamoebae*, and made havoc of the affinities of the *Haeamosporidia* when it comes to the '*Chlamydozoa*' it seems to become entirely divorced from reason. The history of protozoology of recent years is one of the correction of earlier, wild, and impossible views by distinguished, methodical and very careful workers.

One may at once admit that certain diseases, including variola and rabies, are due to filterable viruses that such viruses are living and must be particulate in nature. Their actual state appears to be that of ultra-micromete globoid bodies, as described under the term "micro-micro-organisms" by Lt-Colonel H. M. Gordon. They can to some extent, be grown on artificial media, can be stained and examined by special technique although full proof of their causal connection with the diseases concerned is as yet wanting.

In the case of the Negri bodies of rabies, the careful work of Harvey and Acton (*Parasitology* Vol 5 1912-13) completely disposes of the view that they are parasites. These workers fixed "street virus" for the monkey, *Macacus rhesus*, and studied the Negri bodies in serial passages of the virus. They shewed that in the earlier passages the Negri bodies were large and prominent, but, as the virus became fixed and exalted in virulence for the species of monkey concerned, the Negri bodies got finer and finer and were finally invisible. Also the Negri body is found in scanty numbers in conditions other than rabies e.g. in the cerebral nerve cells of a guinea pig poisoned with viper venom. These bodies are cell inclusion products formed by a discharge of chromatin from the nucleolus of the hippocampal nerve cell, poisoned by the rabies toxin. And, similarly, with the other "*Chlamydozoa*" the case for considering them as

living forms, and not merely as cell inclusions cannot on the evidence at present available, be accepted as in any way proved

Mr Jackson Clarke however goes even further than do the supporters of the chlamydozoal hypothesis. He begins by disinterring from the past Haeckel's Kingdom of the *Monera*. He then finds fault with the cell theory, which he considers to be defective. He believes that living and non-nucleated cells may exist and may within their cell wall form new nuclei *ab initio*, from no pre-existing chromatin. At once we plunge into a maze of new terminology, which we believe to be quite peculiar to this author. Here and there casual inaccuracies occur such as the statement that "there is no essential difference between the organ indicated by a cilium and flagellum". There is all the difference. A flagellum arises from the nuclear apparatus of a *Mastigophoron*, it has a central core of nucleoplasm, and is related to a centrosome or blepharoplast. A cilium arises from the cytoplasm of a *Ciliophoron* and cilia differ from flagella in their movements, structure, origin and functions.

Chapters follow on life cycles among the algae and fungi, and we are finally introduced to the genus *Chytridium*, Braun, 1850, microscopic, parasitic fungi characterised by reproducing by means of zoospores formed in receptacles which have walls of cellulose. The life history of *Synchytrium endobioticum* which causes tumours in potatoes is then described. We are informed that the synchytrian nucleus "is composed of living matter with the least recognisable differentiation of structure and of the greatest potential all cell-organs being formable by it it is toti-potential protoplasm plasson".

In the "cancer bodies" Mr Clarke recognises *Synchytrium* and on page 96 is an extraordinary drawing of "bodies observed in a scraping of a tertiary syphilitic lesion" which most workers would at once put down as degenerated epithelial cells. Both diseases the author considers to be of fungoid origin, apparently.

Turning next to his own favourite group of the *Plassomyinae*, which are allied to the *Synchytrium*, he describes the parasite of molluscum contagiosum as *Plassomyxa contagiosa*. And his contention is supported by a drawing of molluscum bodies as seen in a "teasing of a freshly excised nodule smeared on a slide, fixed with perchloride of mercury solution, and mounted in glycerine and water,"—surely an amazing technique in identifying a new parasite. His method of "growing" the "parasites" is equally amazing. Fresh material is teased, heaped in the middle of a watch glass and a little water added. The whole being then kept covered and moist and at room temperature. In moderate numbers bacteria do not appear to affect the "cultures" obtained. Has ever any serious claim to the discovery of a new parasite been put forward upon such evidence?

We need however pursue the subject no further. Mr Clarke's illustrations, many of them drawn from unstained fresh material, will not satisfy any protozoologist. His details of technique, a most important point in all protistology, are usually left unmentioned. The claim that the *Chlamydozoa* are living bodies is a hypothesis open to reasonable discussion. The claim that they are fungi of a new and extraordinary genus lies outside the domain of present day science.

In brief technique, patience, and the very utmost care are essential in protozoological work and are points in which we consider the book weak. Dobell quotes Henry Baker, 1742, on the following —

"Cautions in viewing objects

"Beware of determining and declaring your Opinion suddenly on any Object for Imagination often gets the Start of Judgment, and makes people believe they see Things, which better Observations will convince them could not possibly be seen. When you employ the Microscope, shake off all Prejudice, nor harbour any favourite Opinions for, if you do, 'tis not unlikely Fancy will betray you into Error, and make you think you see what you would wish to see.

"Remember that Truth alone is the Matter you are in search after. Pass no Judgment upon Things over-extended by Force, or contracted by Dryness, or in any Manner out of their natural State, without making suitable Allowances."

We may be prejudiced, but we consider that the cell theory has not yet broken down and that the plasson state of living matter requires much fuller proof before the scientific world will accept it. Mr Clarke's book is admirably printed and published, but we fear that his work is not as sound as that of his publishers.

BEHNKE'S STAMMERING, CLEFT PALATE SPEECH, LISPING, 2nd Edition, Revised and Enlarged by Kate Emil-Behnke. London: Baillière, Tindall & Cox 1922. Pp. 101. Price, 3/6 net.

THIS little book gives a general account of a method of treating speech defects which has now been in use for forty years. The author rightly lays stress on the necessity for a thorough examination of the patient by a medical man and by a throat and nose specialist before speech training is commenced. In a series of 100 cases, 79 were found to have some sort of obstruction in the upper respiratory passages, such as adenoids, chronic tonsillitis, deflected septum. Treatment of any pathological condition found is followed by breathing exercises, directed to improving the action of the diaphragm and co-ordinating the breathing and voice muscles. The author has proved by X-ray observations that stammering is mainly due to faulty action and failure of co-ordination of the breathing and voice muscles. The earlier training can be commenced the better, provided that the child has acquired sufficient self-control to co-operate. Whilst these principles are common to all, each case must be treated individually according to its special requirements, the best results being obtained where the stammerer's whole time can be devoted to the course. Only general outlines to the methods employed are given.

ANNUAL REPORT.

HEALTH DEPARTMENT, CIVIL AND MILITARY STATION, BANGALORE, ANNUAL REPORT FOR 1921-22

THIS report contains several items of interest. The census of 1921 shews that the population of Bangalore is steadily increasing, 1,18,940 as against 1,00,834 in 1911. The birth rate, 37.99 per mille, was slightly lower than the previous quinquennial average, 42.55. Indian Christians shewed the highest birth rate and Europeans the lowest. The general death rate, 32.74 compares favourably with the previous quinquennial average of 47.82, and there was an excess of 625 births over deaths. The principal causes of death were tuberculosis, 232 deaths, malaria, 78 deaths, and especially plague, with 426 attacks and 372 deaths. The plague mortality, however, was less than in previous years and the measures taken were vigorous and well organised, the total number of inoculations being 2,684 for the year. Influenza was prevalent throughout the year, but was mild in type. Enteric fevers accounted for 65 attacks with 22 deaths, small-pox for 93 attacks with 30 deaths. The death rate in infants under a year old was 229.47 per 1,000 births registered, the second lowest figure since 1900.

With regard to sanitation the conservancy measures throughout the year were satisfactory. There were 16 prosecutions for the sale of decomposed fruit, meat or fish, whilst systematic food inspection was carried out during the year and much bad food destroyed. The sanitation of the markets is reported as being in general satisfactory and there is a welcome absence

of beggars and loiterers With regard to the three slaughter houses 1,437 animals were rejected out of 115,000 and 21 prosecutions instituted The Municipal Laboratory carried out 3,906 examinations Antimalarial operations were carried on throughout the year, special attention being paid to the neighbourhood of the military lines and to the breeding places incriminated by Captain Ghosh, I.M.S., in his antimalarial survey of the station Maternity and child welfare work was continued and its activity increased, a new creche being opened on Thummiah Road, and two additional trained midwives being added to the staff The temporary veterinary hospital on Oosoor Road treated 5,999 animals as against 5,938 in the previous year It is of interest to learn that of 46 dogs kept under observation as having bitten persons not one shewed symptoms of rabies Antirabic measures in Bangalore are vigorously carried out three professional dog catchers were employed during the year 4,281 stray dogs impounded and nearly 1,800 destroyed

The chief interest of the report however lies in its account of the Health and Welfare Exhibition held from August 16th to 21st, 1921 The total cost of the Exhibition was Rs 3,070 of which sum no less than Rs 1,000 were raised by public subscription The Exhibition was kept open for eight days and was visited by about 30,000 persons mostly Indians of all classes A guide book was issued and vernacular translations and literature distributed On the opening day Colonel R. F. Standage, C.I.E. I.M.S. Residency Surgeon, gave an opening address He dwelt upon the enormous debt which the community already owed to the maternity and child welfare movement the Lady Curzon Hospital already admitting over 1,000 maternity cases a year and the work of the health visitors shewing already immeasurably improved results in decline of infant mortality and maternal death rate on the steady improvement in the death rates from plague and cholera, and on the necessity for private subscriptions and non-official co-operation in such movements

During the various days of the Exhibition lantern lectures in both English and in vernaculars were given on such subjects as maternity and child welfare, child welfare schemes communicable diseases and personal and home hygiene There was a babies' day and a baby show with prizes The Exhibition was very successful and attracted so much attention that it was decided to hold a second similar Exhibition from January 3rd to 8th 1923 The value of such Exhibitions in creating and stimulating a "public health conscience" both in individuals and in the masses is evinced by the very large numbers who attended and who cannot have failed to have learnt lessons new and old in elementary hygiene and sanitation

REPORT ON THE PROVINCIAL MENTAL HOSPITAL IN ASSAM FOR 1922

By COLONEL C. H. BENSLEY, I.M.S. I.C.H. (Assam),
Assam Government Press, 8 annas

LIEUTENANT-COLONEL W. D. RITCHIE, I.M.S., who held charge of the Provincial Mental Hospital at Tezpur throughout the year is to be congratulated on the successful working of the hospital during a year of serious overcrowding Including general wards, solitary cells, hospital, tubercle wards, etc., the total available accommodation during the year was for 356 males and 86 females whilst the daily average strength in 1922 was 443.82 as against 426.62 in 1921 As the special cells, wards, etc., have to be reserved for appropriate cases it is obvious that the available accommodation is over-taxed During the year there were 99 admissions, eight re-admissions, 64 persons discharged cured, seven discharged as mentally improved, whilst nine escaped of whom five were recaptured The daily average strength of criminal lunatics under care was 190.25 The vital statistics shew a considerable increase in the number of admissions to hospital 242 as against 120 in 1921,

owing to an influenza outbreak and to a large number of malaria cases There were 28 deaths during the year as against 24 in 1921 The death rate per cent of average strength at Tezpur for 1922, 6.08 per cent, however, bears favourable comparison with that in the other mental hospitals in India where the figures vary from 5.73 to 8.70 per cent Financially the hospital cost less than in previous years, owing to decreased cost of Public Works Department charges and of Europe stores The total cost of maintenance was Rs 82,023, against which must be set off a profit of Rs 13,314 in the manufactory department The male inmates are employed on the cultivation of vegetables, sugar cane, and the manufacture of molasses, jute, carpentry, tailoring, basket making, etc., the female inmates on paddy husking, preparation of spices, etc. General sanitation was good throughout the year, but additional accommodation is badly wanted

Correspondence.

A CASE OF SPLENECTOMY

To the Editor of THE INDIAN MEDICAL GAZETTE

SIR—I read with much interest pages 179 and 180 of the April 1923 issue of the *Indian Medical Gazette* and have much pleasure in giving you a few lines about a case of splenectomy The patient was admitted to hospital for a swelling in the abdomen occupying almost the whole of the right hypochondrium and lumbar regions The tumour was not continuous with the liver, which was normal in position and size. The patient was a multipara with a pendulous abdomen, was emaciated and her condition was bad After careful nursing for a few days her health improved a little. The swelling was diagnosed as a tumour of the abdomen and laparotomy was performed After separation of the adhesions the splenic notch was visible and the pedicle of the tumour could be traced to the left hypochondrium, the normal site of the spleen The pedicle consisted of a hypertrophied splenic artery and vein etc As the adhesions of the tumour were already separated and as it had no support except the pedicle, it was thought advisable to remove the enlarged spleen The pedicle was cut after careful ligaturing On removal, the organ weighed about 7 lbs The patient, though given up as hopeless, made a wonderful recovery, improved in her health and increased in weight. The question may arise as to why the diagnosis was not made before operation The patient though she had chronic malaria, never gave a history of it and the tumour was lying entirely on the right side Had the tumour been diagnosed as a malarial spleen nobody would have undertaken to remove it and the patient would have left the hospital without getting any relief for the complaint for which she was admitted This operation was performed by a District Surgeon whilst I was in the Madras Medical Department.

26th April, 1923

Yours, etc.,
C. P. IPE,
Medical Officer,
Chowarah, Cochin State

THE TREATMENT OF RHEUMATISM BY SODIUM SALICYLATE INJECTIONS

To the Editor of THE INDIAN MEDICAL GAZETTE

SIR,—During the last few months I have had the chance of treating about 15 cases of acute rheumatism with inflammation of the joints and fever As usual I treated the first few with big doses of sod salicylas by the mouth, but it took me a long time to ameliorate their sufferings It occurred to me to try injections of sod. salicylas in such cases, and these have given me most satisfactory and rapid results

The technique I adopt is to dissolve 15 grams of sod salicylas in 15 cc of distilled water or normal saline and inject it around the painful and inflamed joints at the rate of 10 to 15 minims per spot, and if there is no inflamed joint and the patient complains of pain all over his body and joints then I inject the whole of the quantity deeply into the buttock. The cure is immediate, the pain disappears in no time and the fever goes down within 5 or 6 hours. The swelling of the joints subsides within a week.

I give these injections daily and have never done more than four. I continue sod salicylas gr v per dose orally three times a day for a month after discontinuing the injections. During the course of injection I give nothing but mild saline purgatives if required.

Yours, etc,

RAJA RAM,

Sub-Assistant Surgeon Civil Dispensary
Naukana State

29th April 1923

REMOVAL OF TATTOO MARKS

To the Editor of THE INDIAN MEDICAL GAZETTE

DEAR SIR—Will you or any of your numerous readers kindly tell me how to remove tattoo or gun-powder marks?

Yours, etc,

I T MITTRA, I M S

EGERTON ROAD DELHI
8th June, 1923

Service Notes.

APPOINTMENTS

THE Hon'ble Major General R Charles MacWatt, CIE, MB, BSC, FRCS, FZS, KHS, Director General, Indian Medical Service, has been elected an Honorary Member of the College of Physicians, Edinburgh.

MAJOR J D SANDES, MD, I M S, is appointed to officiate as Professor of Clinical Medicine, Medical College, Calcutta and Second Physician, Medical College Hospitals, *vice* Lt-Col D McCav, MD, I M S.

LIEUTENANT-COLONEL H AINSWORTH, MB, FRCS, I M S, Principal and Professor of Ophthalmology, King Edward Medical College, Lahore is appointed to be Inspector-General of Civil Hospitals, Bihar and Orissa, in succession to Colonel H Austen Smith, CIE, MB, KHS, I M S, with effect from the 3rd May, 1923.

CAPTAIN J C DE, I M S, substantively *pro tempore* Resident Medical Officer, Medical College Hospitals, Calcutta is appointed to act as a Civil Surgeon and is posted to Chittagong *vice* Lt-Col H B Steen, MS, MD, I M S.

CAPTAIN N C KAPUR, I M S, is appointed to be substantively *pro tempore* Resident Medical Officer, Medical College Hospitals, Calcutta, *vice* Captain J C De, I M S.

SUBJECT to His Majesty's approval, the undermentioned officer is appointed permanently to the Indian Medical Service as a Lieutenant by the Right Hon'ble the Secretary of State for India. His commission will bear date 16th December, 1922.

PERCIVAL ARTHUR CLIVE DAVENPORT (Captain Indian Medical Service, Temporary Commission)

SUBJECT to His Majesty's approval, the undermentioned gentlemen to be temporary Lieutenants, Indian Medical Service, with effect from the 3rd February, 1923.

AMARNATH CHOPRA and CHUNI LAL BHOLA

THE Governor with the concurrence of the Minister is pleased to appoint Major C M Plumtre, I M S, to act as Medical Officer Kathiawar Political Agency, and in medical charge of the West Hospital, Rajkot, with attached duties, *vice* Lieutenant-Colonel Hooton, CIE, I M S.

THE Governor with the concurrence of the Minister is pleased to appoint Lieutenant-Colonel A Hooton, CIE, I M S, to act as Surgeon-General with the Government of Bombay with effect from the date on which Major General W E Jennings, MD, I M S, proceeds on leave.

THE Governor with the concurrence of the Minister is pleased to appoint Dr F N Kapadia, MD (Bom), to act as Professor of Pathology at the Grant Medical College, Bombay, with effect from the date on which Major S S Vazifdar, I M S, assumes charge of the duties of the Second Physician, J J Hospital, Bombay.

LIEUTENANT-COLONEL H H BROOME, MB, FRCS, I M S, Professor of Surgery, King Edward Medical College, Lahore is appointed to be Principal of the College with effect from the date on which he assumes charge of his duties.

CAPTAIN S N HAYES, FRCS, I M S, Officiating Professor of Physiology, King Edward Medical College, Lahore is appointed to officiate as Professor of Ophthalmology at that College, with effect from the date on which he assumes charge of his duties, and until further orders.

LIEUTENANT-COLONEL C B MACCONAGHY, I M S, is appointed temporarily to officiate as Political Agent in Bhopal in addition to his duties as Agency Surgeon in Bhopal, with effect from the 4th May, 1923.

MAJOR H E SHORTT, MB, I M S, Officiating Director, Pasteur Institute, Shillong, is appointed as a Supernumerary Officer attached to the Institute, with effect from the 1st June 1923.

CAPTAIN J M SHAH, MBE, I M S, Deputy Assistant Director-General, Indian Medical Service is appointed Assistant Director-General, Indian Medical Service (Sanitary), with effect from 1st June, 1923.

CAPTAIN H G ALEXANDER, FRCS, I M S, is appointed to officiate as Professor of Ophthalmic Surgery, Medical College, Calcutta and Ophthalmic Surgeon to the College Hospitals during the absence, on leave of Lt-Col W V Coppinger, DSO, MD, FRCS, I M S.

LIEUTENANT-COLONEL T H SYMONS, MB, I M S, is appointed to officiate as Surgeon-General with the Government of Madras *vice* Major-General Sir Gerald Giffard, KCIE, CSI, KHS, I M S, who has been granted leave preparatory to retirement.

CAPTAIN J M R HENNESSY, I M S, of the Indian Station Hospital Allahabad to officiate as Civil Surgeon Allahabad in addition to his own duties during the absence of Lieutenant-Colonel R F Baird, I M S, granted leave.

LEAVE.

LIEUTENANT-COLONEL H R NUTT, I M S, Professor of Surgery, King George's Medical College, Lucknow is granted study leave for five months in continuation of the College vacations of 1923, followed by leave on half average pay for one month, with effect from the date he is relieved of his duties.

MAJOR A S M PREDIES, I M S, on reversion to civil employ was granted leave on average pay for nine months under rules 77(b) and 81(b) of the Fundamental Rules, with effect from the 24th March, 1922.

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- (d) *During lactation when it increases the nutritive value of the maternal milk.*
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LIEUTENANT-COLONEL A HOORON, CIE, IMS, Medical Officer, West Hospital Rykot is granted leave on average pay from 6th April, 1923 to 1st May 1923, both days inclusive

It is hereby notified that of the extension of leave for six months on medical certificate granted to Lieutenant-Colonel F O N Mell, CIE MB CM (Edin) DPH (Cantab) IMS Inspector-General of Prisons, Bombay Presidency in Government Notification Home Department No S 21 dated the 3rd April 1923 one month has been sanctioned on average pay and five months on half average pay

MAJOR M S IRANI IMS has been granted leave on average pay for four months with effect from the 15th May, 1923, or from the date of relief

LIEUTENANT-COLONEL R F BAIRD IMS Civil Surgeon, Allahabad is granted leave on average pay for two months, with effect from the 14th May, 1923

LIEUTENANT-COLONEL F D S FAYRER IMS an Agency Surgeon is granted leave on average pay for eight months and leave on half average pay for ten months and five days under the Fundamental Rules, with effect from the 23rd April 1923

LIEUTENANT-COLONEL G MCPHERSON CIE IMS has been granted by His Majesty's Secretary of State for India extension of leave by six months on medical certificate

LIEUTENANT-COLONEL W V COPPINGER DSO MD FRCSI IMS Professor of Ophthalmic Surgery Medical College Calcutta and Ophthalmic Surgeon to the College Hospitals is allowed leave on average pay for six months under article 81 (b) (i) of the Fundamental Rules with effect from the 5th May 1923 or from any subsequent date on which he may avail himself of it

MAJOR A S SIMPSON IMS Superintendent of the Dacca Central Jail is allowed leave on average pay for five months (including a period of twenty nine days on account of privilege leave at his credit), under article 81 (b) (i) of the Fundamental Rules with effect from the 22nd May 1923 or any subsequent date on which he may be relieved

RETIREMENTS

SUBJECT to His Majesty's approval Lieutenant-Colonel Edmund Hamilton Blake Stanley has been permitted by the Right Honble the Secretary of State for India to retire from the service with effect from the 30th January, 1923

SUBJECT to His Majesty's approval, Major Arthur Charles Ingram, MD has been permitted by the Right Honble the Secretary of State for India to retire from the service with effect from the 27th November 1922

RESIGNATIONS

CAPTAIN GOVIND SHIVRAM MANDLIK is permitted subject to His Majesty's approval to resign his temporary commission, with effect from the 2nd January, 1923 and to retain his rank.

THE undermentioned officers are permitted subject to His Majesty's approval to resign their temporary commissions with effect from the dates specified, and to retain the rank of Captain —

CAPTAIN NIRANJAN CHAKRAVARTY Dated 11th March 1922

CAPTAIN KARAM CHAND UPPAL Dated 3rd February 1923

UNDER the provisions of section 93 of the Government of India Act His Excellency the Governor is pleased to accept the resignation tendered by Major-General

Benjamin Hobbs Deane CIE IMS of his office of member of the Bengal Legislative Council

THE undermentioned officer is permitted subject to His Majesty's approval to resign his temporary commission with effect from the date specified —

CAPTAIN KHUDU BAKSH AWAN Dated 10th April 1923

TRANSFERS

ASSISTANT SURGEON HARENDRA KUMAR DAS officiating Civil Surgeon is transferred from Chittagong Hill Tracts to Bakarganj vice Captain H Hingston, MB, IMS transferred

MAJOR W D WRIGHT IMS Civil Surgeon, from Mirzapur to Muttra

MAJOR B L M NEWLAND IMS Civil Surgeon, from Muttra to Saharanpur

THE following Notification by the Government of India Home Department is republished —

No F 529-Jails dated the 21st March 1923

THE services of Major L E Doyle DSO IMS are placed temporarily at the disposal of the Government of Bombay with effect from the date he assumes charge of his duties in the Jail Department

THE services of the following officers of the Indian Medical Service are placed temporarily at the disposal of the Government of Bihar and Orissa with effect from the dates mentioned against their names —

MAJOR D COLTTS MB 2nd December 1922

MAJOR C G HOWLETT MB 21st December, 1922

THE services of Majors A H Proctor DSO MD IMS and W L Harnett MB FRCS IMS are placed permanently at the disposal of the Government of Bengal with effect from the 28th June, 1922 and 1st October, 1922 respectively

MAJOR W D WRIGHT IMS Civil Surgeon from Muttra to Aligarh

THE services of Major S S Vazifdar IMS are placed temporarily at the disposal of the Government of Bombay with effect from the date on which he assumes charge of his duties

THE services of Major O A R Berkley-Hill, MD IMS are placed permanently at the disposal of the Government of Bihar and Orissa with effect from the 5th January, 1923

THE services of Majors J F James MB IMS and A T Babonau, CIE OBE MB IMS are placed permanently at the disposal of the Government of Assam

THE services of Captain P Verdon, IMS, are placed temporarily at the disposal of the Government of Madras, with effect from the date on which he assumes charge of his duties

THE services of Captain H G Alexander, FRCS, IMS are placed temporarily at the disposal of the Government of Bengal for employment as officiating Professor of Ophthalmic Surgery, Medical College, Calcutta, with effect from the date on which he assumes charge of his duties

THE services of Captain J C John, OBE MB IMS, are placed temporarily at the disposal of the Government of Bihar and Orissa, with effect from the 3rd May, 1923

THE services of Captain N D Puri, I M S, are placed temporarily at the disposal of the Government of Bengal for employment in the Jail Department, with effect from the date on which he assumes charge of his duties

THE services of Major K G Pandalai, M B, F R C S, I M S, are placed temporarily at the disposal of the Government of Madras, with effect from the 24th April, 1923

THE services of Major E C Hodgson, D S O, I M S, Officiating Assistant Director-General, Indian Medical Service (Sanitary), are placed at the disposal of the Government of Assam for appointment as Officiating Director, Pasteur Institute, Shillong with effect from the 1st June, 1923

THE services of Captain R H Malone, M D, I M S, an Officer of the Medical Research Department, are placed at the disposal of the Government of Burma for appointment as Officiating Assistant Director, Pasteur Institute, Rangoon, with effect from the date on which he assumes charge of his duties

THE services of Captain A H Harty, I M S, are placed temporarily at the disposal of the Government of Bombay for employment as Superintendent, Central Mental Hospital, Yeravda, with effect from the 2nd March, 1923

THE services of Captains F J Anderson and V Mahadevan I M S, are placed temporarily at the disposal of the Government of Madras, with effect from the dates on which they assume charge of their duties

Honours.

THE following names appear in the Home and Indian Birthday Honours Lists. We tender our congratulations to the recipients

O.B.E.

Captain Hallinan, Medical Officer, Basra

C.B.

Colonel W H Ogilvie
Colonel Harry Ross

C.I.E.

Lieutenant-Colonel A Leventon, I M S, Campbell Medical School, Calcutta

Lieutenant-Colonel T Hunter, I M S, Civil Surgeon, Lucknow

Lieutenant-Colonel R McCarrison, I M S, Medical Research Department, India

Major D P Johnstone, Surgeon to the Governor of Madras

O.B.E.

Military Division

Lieutenant-Colonel G I Davys, I M S, in charge Military Food Laboratory, Kasauli

M.B.E.

Civil Division

Dewan Singh Duggal, Civil Surgeon, Punjab
Miss A Henderson, Lady Doctor, United Free Church Mission, Nagpur

Military Division

Captain A F B Saldhana, I M S

I S O

Mr J Demello, Superintendent of the Office of the Surgeon-General with the Bombay Government

Kaisar-I-Hind Medal, First Class

Miss W J Meiklejohn, Nursing Superintendent, General Hospital, Rangoon

Mrs L A Starr, of the Peshawar Mission Hospital, is awarded a bar to the Kaisar-i-Hind Medal of the First Class

Kaisar-I-Hind Medal, Second Class

Dr R. W Fisher, Director, Vaccine Institute, Belgaum

Mr J Sisings, Medical Practitioner, Bihar and Orissa.
Narayan Canaji Rao, Sub-Assistant Surgeon, senior grade, 1st class, Sehore, Central India.

NOTICE.

A MODERN X-RAY DEPARTMENT

A SMALL and beautifully illustrated brochure which we have received gives a detailed account of the new X-ray department at the Manchester Royal Infirmary. The department was installed as the result of a donation of £5,000 to the Infirmary, was designed and equipped by Messrs Watson and Sons (Electro Medical), and is one of the finest in existence. The ground plan shews two separate entrances, one for general and one for private patients. The wing is traversed by a central lobby, from which open off demonstration room, consulting room, treatment cubicles, an office, dark-room, ordinary and special radioscopic rooms, an intensive treatment room, and dressing cubicles. The demonstration room has a Victor table embodying every recent refinement and adaptable in an instant for either vertical or horizontal work, also a stereoscopic viewing apparatus and a cabinet for a collection of half-plate reductions which will constitute a radiological museum. The radioscopic rooms contain tilting couches, a motor-driven mixer for opaque food, and a device for testing whether the examiner's eyes are ready to undertake screen examinations. A chair for special dental radiography is a special and useful feature. In a second radiographic room is a table fitted with the Potter-Bucky diaphragm for modern high-grade radiography. In the dark-room there is ample space for comfortable working, also indirect lighting, and a device for temperature control of the tanks which does away with the troubles arising from transferring films from a developer at one temperature to a fixing bath at another. The tubes in the treatment cubicles are controlled from outside by switch panels, each cubicle being fully in view through lead glass inspection windows, and each cubicle is entirely self-contained. The deep therapy room is equipped with two sets of the Erlangen type, whilst a workshop in the wing provides for repairs, adjustments, etc., on the spot. The department is equipped throughout with Coolidge tubes, and Manchester and Messrs Watson and Sons are alike to be congratulated on a fine piece of work and a most valuable addition to the medical amenities of the city.

Notice.

SCIENTIFIC Articles and Notes of interest to the profession in India are solicited. Contributors of Original Articles will receive 25 Reprints *gratis*, if asked for at the time of submitting their manuscripts.

Communications on Editorial Matters, Articles, Letters and Books for Review should be addressed to THE EDITOR, *The Indian Medical Gazette*, c/o Messrs Thacker, Spink & Co., P O Box 54, Calcutta.

Communications for the Publishers relating to Subscriptions, Advertisements, and Reprints should be addressed to THE PUBLISHERS, Messrs Thacker, Spink & Co., P O Box 54, Calcutta.

Annual Subscription to "*The Indian Medical Gazette*," Rs 16 including postage, in India Rs 18 including postage, abroad.

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Original Articles.

THE DENGUE-SAND-FLY FEVER PROBLEM

By J W D MEGAW, Lt-Col., I.M.S.,

*Director and Professor of Tropical Medicine,
Calcutta School of Tropical Medicine*

THE recently reported discoveries of spirochaetes in fevers belonging to the dengue-sand-fly fever group by Couvy and Whittingham give grounds for the hope that the existing state of confusion in connection with these diseases will shortly be cleared up and that a rational classification of the short fevers, based on the characters of the virus will be available.

A survey of the text-books on tropical diseases and of the recent literature on the short fevers shows that a most undesirable degree of complication has been imparted to the subject there are many articles in which "new" fevers have been described under a great variety of names, some of these suggest that the new fever has a definite duration "three" "four," "five" "six," and "seven days' fevers" have been described, other writers apply the name of the place in which the outbreak has been seen and so suggest that the disease is peculiar to that locality.

The claim for the discovery of a new disease would, in most cases, have been recognised to be unjustified if the authors had been aware of the following facts in connection with the fevers of the dengue group —

I Fevers of the dengue-sand-fly group may last from one to seven days very exceptionally longer.

II These fevers show a great variety of symptoms, not only at different times and in different places, but also in the different cases of the same outbreak in fact the only common clinical features of the fevers of the group are their sudden onset and short duration.

III The fevers of the group are extremely common and widespread over the tropical and sub-tropical world.

IV They may occur as sporadic cases in an endemic area, or as intense epidemics, according to circumstances.

All outbreaks of fever of short duration should be placed provisionally in the group unless there are good reasons for excluding them. It is not suggested that all short fevers should automatically be regarded as belonging to the group and that no attempts should be made to isolate new and distinct fevers, it is quite probable that such do exist but it is quite certain that most of the descriptions of new fevers would never have been written but for the misleading and one-sided

descriptions of dengue which are found in the text-books. If dengue is regarded as a disease in which break-bone pains, a two-phase fever and a secondary rash are essential features, it is not surprising that medical men should have looked upon outbreaks of fever in which these characteristics are absent as being distinct diseases.

Till recently our classification of many fevers has necessarily been based on their epidemiology and symptomatology, and such classification must be subject to confirmation or rejection when the causal organism has been discovered. The main objects served by this makeshift classification have been to help the medical man in the management of his cases and to form a basis for statistical records, and the best provisional classification is the one which gives us the greatest help in these respects. When the causal organism and its mode of conveyance to man have been discovered all other considerations fall into the background, but until the virus has been discovered the principles which ought to be followed are those stated above.

Until a knowledge of the characters of the virus has been obtained it is desirable, as a provisional measure, to group together all those diseases which are so closely related to each other that no useful purpose is served by placing them in separate groups.

In the case of diseases showing great variability in symptoms, it is obviously possible to create an indefinite number of types but from the point of view of the student and medical man it is much better to group them together and to describe the variations which occur rather than to give detailed accounts of all the variants as if they were independent diseases.

In the case of the short fevers of the dengue group it seems to be preferable to employ the old fashioned and long established term "dengue" as the common name for all the members of the group and to add to this any special designations which will indicate the special features of the divergent types.

It is admittedly impossible to distinguish clinically between many cases of sand-fly fever and dengue and there are many outbreaks in which it is not possible to tell whether the disease is conveyed by a mosquito or a sand-fly so that it is often a question of custom or of the special predilections of the medical man whether he calls the disease dengue or sand-fly fever. In such cases the use of the term dengue, or fever of the dengue group, is preferable to making a distinction for which there is no justification. In outbreaks in which the features are such that there is no reasonable doubt as to the insect carrier concerned it is quite permissible to use the terms "mosquito dengue" and "sand-fly dengue."

Such a classification ought to meet the requirements of those who are convinced of the existence of two distinct diseases, it will also overcome the difficulty which is so often experienced of deciding to which type the disease belongs, as the term "dengue" or "dengue group" would be employed when circumstances do not justify dogmatism regarding the insect vector. There would also be no objection to such names as "three-day dengue" or "seven-day dengue" in suitable cases.

It is important that all medical men in the tropics should be taught to include in the dengue group all cases which show the following characters —

I Fever of less than eight days' duration for which there is no discoverable cause such as malarial parasites, relapsing fever spirochætes, lung or throat lesion insolation or such like

II Sudden onset, with or without pains over the eyes and in the back and limbs

III The occurrence of other cases of the same general type in the locality under circumstances which point to the probability of insect carriers being at work rather than person to person communication. Epidemics are common, but in endemic areas the disease may be confined to new comers from places where the disease does not occur

IV The absence of appreciable mortality

V The absence of any special feature by which the fever can be assigned to any other disease group like yellow fever

If an outbreak of fever occurs which complies with the above requirements it is comparatively easy to make a diagnosis of fever of the dengue group, and the question of specifying whether the disease should be called mosquito dengue or sand-fly dengue can then come up for consideration

Though there is no reliable means at the disposal of the medical man for distinguishing every case and every outbreak as mosquito dengue or sand-fly dengue, the following points are usually accepted as grounds for distinction between the two

I Most of the cases of sand-fly dengue show only one fever phase while in most outbreaks of mosquito dengue a considerable proportion of the cases show a two-phase fever, the second phase appearing either as a second distinct paroxysm, or as an exacerbation of the first fever phase. In practice it is usual to employ the term sand-fly fever when nearly all the cases show fever with only one phase, while the term dengue is employed when a considerable proportion of the cases show a fever of two phases but as sand-fly fever sometimes shows two-phase fever and dengue often has only one phase, this point of distinction is by no means absolute.

II In mosquito dengue there is often a rash which appears about the fourth or fifth day while in sand-fly dengue a rash is uncommon. Here, again, the distinction is only relative, for in many outbreaks of the classical type of dengue a rash is seen in only about 10 per cent or so of the cases, and a secondary rash has often been observed in cases which have been classed as sand-fly fever

III Sand-fly dengue has been proved to be capable of being carried by certain species of phlebotomus, while mosquito dengue has been proved in some cases to be carried by *Stegomyia* mosquitos but there is not sufficient evidence to show that each type of the fever is capable of being carried only by the insect which has been proved to be capable of carrying it and by no other, and even if this point were established it would often be difficult to decide which insect is concerned with any particular outbreak, as mosquitos and sand-flies are often found to be prevalent in the affected place at the same time

IV Birt and others have stated that dengue and sand-fly fever may occur in the same person at short intervals and hence assert that the one disease does not immunise against the other. If it can be definitely established that each disease immunises against subsequent attacks of the same fever but not against subsequent attacks of the other fever it will be proved that the diseases are distinct but it is doubtful whether the evidence at our disposal justifies any confident assertion to this effect and it is obvious that the medical practitioner will seldom be helped in classification by evidence of such selective immunity

Various other minor points of distinction have been made between the two diseases, but these are of relatively small importance and cannot be relied on to help in the diagnosis, so that though there is a general consensus of opinion that there are two distinct diseases the one carried by a sand-fly and the other by a mosquito, the medical man in actual practice will often be at a loss to distinguish between them and while he will be able in many cases to assign the outbreak with some degree of confidence to the sand-fly or mosquito respectively, it will often be impossible for him to attain to a greater degree of precision than to place the outbreak in the dengue group

As an example of the confusion which attends the existing teaching with regard to dengue may be mentioned the recent paper by Major Loughnan R A M C on "Three Hitherto Unclassified Fevers in Jamaica". From the charts and descriptions it is obvious that one of these fevers corresponds closely to the type of fever first described by Rogers as the "Seven-Day Fever of Calcutta" but now included by him in the dengue group,

another fits in well with the classical descriptions of dengue, while the third is exactly like sand-fly fever. Major Loughnan finds it difficult to call the latest disease sand-fly fever as phlebotomi are said to be quite unknown in Jamaica and hence we are faced with the paradox 'sand-fly fever without sand-flies'.

It may be noted that all three types of fever correspond very closely with the three main forms of dengue described by me as occurring in Calcutta (1) and afterwards reported by various observers (2) as occurring in outbreaks of dengue in widely separated parts of the globe.

The recent work of Couvy in Beyrouth in Syria and of Ledingham in Malta is an important step in connection with the problem, but it does not clear up the existing difficulty. Couvy has found a spirochæte in several cases of short fever in Beyrouth and Libau and has succeeded in reproducing the disease in rabbits by inoculating them with the emulsified bodies of starved phlebotomi. From the existence of a secondary rise of temperature and a characteristic rash he is convinced that he is dealing with dengue and not sand-fly fever.

In Beyrouth *Stegomyia* and *Culex* mosquitos as well as sand-flies were abundant, but in Libau no mosquitos were found and only sand-flies could be incriminated. Here there occurs another apparent paradox "dengue without mosquitos".

Whittingham cultivated spirochætes in Wenyon-Noguchi medium from the blood of 6 out of 26 cases of sand-fly fever in Malta, but failed to reproduce the disease in guinea-pigs or in man by inoculations of the cultures.

The interesting point now arises—two independent workers have found evidence of spirochætal infection the one in a disease which he regards as dengue the other in a disease which he classes as sand-fly fever but a comparison of the charts and descriptions given by the two observers shows that they were dealing with the same disease (see charts), and the duration of the fever in the great majority of the cases in which spirochætes were isolated shows that it differs in a marked degree from the vast majority of previously observed cases of either disease.

Both dengue and sand-fly fever last less than eight days in at least 99 per cent of all cases, while the cases of Couvy and Ledingham lasted as a rule eleven or twelve days.

At least one of Ledingham's cases showed jaundice, and the occurrence of this as well as the duration of the fever indicate that the disease was a special type of dengue showing

a distinct suggestion of relationship to infective jaundice, the parasite of which is very similar in appearance and cultural characteristics to the spirochæte cultivated by Ledingham.

The further interesting question arises as to the relationship between dengue yellow fever and infective jaundice. In the latter two diseases spirochætes have been fairly definitely established as the casual organisms, while in the dengue group the only recorded findings of a spirochæte are those of Couvy and Ledingham*.

The clinical characters and epidemiology of dengue and yellow fever in themselves, however leave little room for doubt as to the close relationship between the two diseases and apart from the work of Couvy and Ledingham it is probably only a matter of time until the spirochæte of dengue is discovered.

The discovery of spirochætes by Ledingham and Couvy does not at all help to clear up the problem of the relationship between dengue and sand-fly fever. It merely accentuates the difficulty in finding a reliable means of distinguishing between the members of the dengue group.

A misconception has arisen regarding the relationship between Rogers' "Seven-Day Fever" and the Japanese "Seven-Day Fever". Even such reliable guides as Stitt's and Manson Bahr's text-books appear to me to be seriously misleading on this question. Both of these suggest that the two diseases are the same.

TABLE I

	Rogers' Seven Day Fever (Endemic Dengue)	Japanese Seven Day Fever (probably a form of Infective Jaundice)
Mode of infection	Biting insect	Alimentary canal or skin or by the bite of the mouse or field mouse
Reservoir of infection	Man only	Field mouse
Jaundice	Absent	Present
Virus	None discovered	<i>Leptospira hebdomadalis</i>

Table I ought to clear up the misunderstanding that so widely prevails regarding these two diseases. Incidentally the confusion of ideas which has arisen is a further illustration of the disadvantages attending on the use of names which suggest a particular duration of a fever, the name seven-day fever has been applied to at least three distinct diseases a form of relapsing fever being the third.

(1) MEGAW—*Indian Medical Gazette*, Nov 1906, Jan 1909 and July 1919.

(2) MUNRO—*Indian Medical Gazette*, Sept, 1911.
HARNETT—*Indian Medical Service*, Dec, 1916.
KING—*New Orleans Medical and Surgical Journal*, Feb, 1917.

* To these may be added a case of typical dengue in Calcutta in 1921 in which I found a single spirochæte in the blood during the first few hours of the illness. This finding is not regarded as establishing a claim to the discovery of the virus of dengue, as animal experiments with the blood were unsatisfactory and no other spirochætes were found.

TABLE II.
SPIROCHÆTAL AND RELATED FEVERS

	Yellow Fever	DENGUE GROUP.			INFECTIVE JAUNDICE GROUP		RELAPSING FEVER GROUP		
		Mosquito Dengue (Dengue)	Sand-fly Dengue (Sand-fly Fever)	Couvy and Whittingham's Dengue (?Dengue? Sand fly Fever)	Japanese Seven-Day Fever	Infictive Jaundice	Louse Relapsing Fever	Tick Relapsing Fever	Rat Bite Fever.
Usual duration	5-10 days	1-7 days rarely more	1-4 days (rarely up to 7)	12 days	7 days	7 days to 3 weeks or more	3 days to 3 months	3 days to 2 months or more	Up to several months
Duration of each cycle	4-5 days	4-5 days	4-5 days	9-10 days	?	About 13-15 days	About 13-15 days	About 10 days	6-7 days
Number of cycles	1-2	1-2	Nearly always one, occasionally two	1-2 usually 2	1	1-2	1-3 or more	Several as a rule	Many
Special symptoms	Jaundice Albuminuria	Rash with second fever common	Rash and second fever common	Rash some times with second fever phase Jaundice occasional	Jaundice	Jaundice	Jaundice common	Jaundice common	Local sore.
Virus	Leptospira icteroides	Filtrable Spirochæte	Filtrable Spirochæte	Spirochæte	Spirochæte (Leptospira hebdomadalis)	Spirochæte (Leptospira icterohæmorrhagiae)	5 Spirochæte (Spirochæte recurrentis)	Spirochæte (Spirochæte recurrentis)	Spirochæte (Spirochæte morsus muris)
Insect vector	Stegomyia (Aedes calopus)	Stegomyia proved Culex suspected, other insects not tested fully	Phlebotomus proved insects not tested fully	Probably Sand-fly, other insects not fully tested	Nil (Bite of field mouse)	Intestinal or skin infection	Louse Possibly bug also	Certain ticks (Ornithodori and Argasides)	Nil Inoculation by bite of rat
Animal Reservoir	Man only known	Man only known	Man only known	Man only known	Field mouse	Rat	Man only known	Man ?Also rat, etc	Rat, cat, etc
Distribution	Certain focus in tropics and subtropics	Tropical or subtropical	Subtropical or tropical	Malta and Syria but probably elsewhere	Certain places in Japan ?Elsewhere	World wide	Wide	Certain localities Central Africa Persia and Central America	World wide
Mortality Range	1-85%	0-1%	0-1%	0	Nil	10-30%	1-70%	1-10%	2-10%
Average about	20%	05%	05%			20%	10%	5%	5%

Note that by the term cycle is meant the period elapsing between the onset of one paroxysm and the onset of the next, viz., fever paroxysm plus fever free interval.

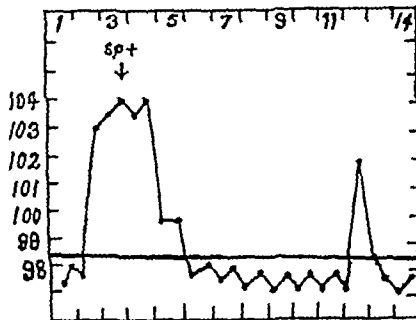
In the case of yellow fever the existence of two cycles is only occasionally indicated by a fall in the temperature after 3-4 days

THE DENGUE-SAND-FLY FEVER PROBLEM

BY LT COL. J W D MEGAW, I M S,

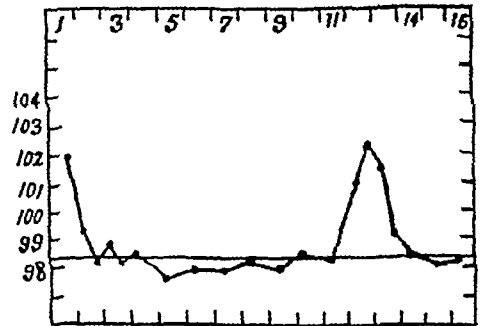
Director and Professor of Tropical Medicine, Calcutta School of Tropical Medicine

CHART I



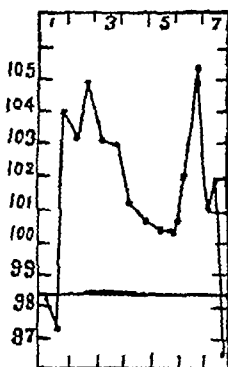
Temperature curve of average case of Couvy's "Dengue"

CHART II



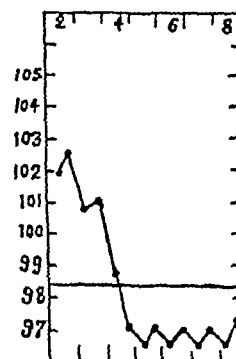
Curve of case of Whittingham's "Sand Fly Fever"

CHART III



Typical Dengue chart

CHART IV



Typical Sand Fly Fever chart

elaboration of the treatment about to be described, were carried out

THE BEARING OF THE REACTION OF THE BLOOD IN MALARIA ON THE CURE OF THE DISEASE

1 *The reaction of the blood in relation to immunity* As long ago as 1890 Von Fodor (9) found that animals surviving infections showed an increased alkalinity of the blood, whereas in those that died the alkalinity was decreased. According to Calabrese (10) the alkalinity of the blood increases the immunization of animals against toxins.

Is it not possible therefore that by restoring the alkali reserve of the body to normal we might assist the body to overcome an infection?

2 *Malarial relapse and conditions producing "acidosis"* It is known that a diminution of the alkali reserve of the body is liable to occur (a) in fatigue and over-exertion, (b) in starvation, (c) after excessive cold and exposure, (d) in many febrile diseases, (e) after severe accidents, (f) after anæsthesia, and (g) in conditions of general debility. It is probably more than a coincidence that all these conditions should be exciting causes of relapse in uncured malarial cases.

Does the diminution of alkali reserve in the body make the body fluids more favourable to the growth of the malarial parasite, and at the same time make the body conditions such that the symptoms of the disease are more easily produced?

3 *The reaction of the blood in relation to the lethal action of the cinchona alkaloids on the malarial parasite* Acton (11) in 1921 found that the lethal action of the cinchona alkaloids was greater in an alkaline medium than in a neutral one, in the case of a free-living protozoon—*Paramæcium*—these substances being seven times more lethal at pH of 8 than at the neutral point, pH 7. Michaelis (12) in the same year reported similar findings in the case of bacteria. These results would seem to indicate that any treatment which would tend to prevent a decrease of the alkali reserve of the body, or would raise it, might materially assist the action of the cinchona alkaloids in malaria.

4 *The effects of the composition of the quinine mixture given orally* In very few of the accounts of the experiments in malarial treatment carried out during recent years has any indication been given of the exact composition of the quinine mixture given orally. This seems to have been considered of little importance and, as far as one can gather, the mixture usually given was a simple solution of quinine in a dilute mineral acid.

The administration of mineral acids by the mouth is one of the known causes of "acidosis." Gotto (13) has found that the administration of dilute mineral acids to a dog causes a lowering of the alkali reserve and a tendency to nephritis. The amount of dilute mineral acid usually given to an adult daily with 30

grains of quinine in solution is half the amount per kilo body weight used by Gotto, so that by giving such a mixture in malaria we are tending to diminish an already low alkali reserve and at the same time making the reaction of the body fluids less favourable for the optimum lethal action of the quinine.

This effect can be avoided by the use of citric acid as a solvent for the quinine, as this acid is changed into carbonate in the body and acts as an alkali.

PREVIOUS USE OF ALKALIES IN THE TREATMENT OF MALARIA

1 Tomassi-Crudelli in the eighties strongly recommended citric acid in malarial treatment and Grall and Marchoux (14) in 1910 also advocated the use of fruit juices and organic acids. As organic acids are changed into carbonates in the body their effect probably depends on the alkali produced.

The effervescing quinine mixture of Burney-Yeo probably owed its success to the same principle, but in this method of giving quinine a very large proportion of the quinine is precipitated in the vessel in which it is given and so is not received by the patient.

2 The old procedure of withholding quinine until the temperature was normal, and of giving diaphoretic mixtures, was probably sound in practice, for the latter mixtures are usually alkaline. If the method advocated is used it would not be necessary to wait for the fall of temperature.

3 Most observers are agreed that there is a close relation between malaria and black-water fever, and MacGilchrist (6) believed that a condition of lowered alkali reserve ("acidosis") was an important factor in the production of the latter disease. The most successful treatments of this disease (Hearsay's and Sternberg's) are alkaline treatments, and possibly act by reinforcing the alkali reserve. It is possible that, in cases of threatened hæmoglobinuria or in persons liable to it when given quinine, quinine might be given with impunity if large doses of alkali were previously administered in such doses as would make the urine alkaline and keep it alkaline.

4 Practically all clinicians are agreed that preliminary purgation is essential in the treatment of malaria, and many physicians in India have noted the beneficial effects of combining a small amount of magnesium sulphate with each dose of quinine, although this does not seem to be mentioned in any of the standard medical text-books, nor does its use seem to have been recorded in any of the large experiments conducted during the war.

This drug is usually said to act by stimulating the liver or by removing mucus from the intestinal wall, thereby facilitating the absorption of quinine, or in both these ways.

The action of this drug in increasing the alkalinity of the portal blood in animals is reported by Acton(11) who suggested that this increased alkalinity might be beneficial in enhancing the parasitocidal action of quinine.

The addition of moderate doses of this drug to each dose of quinine mixture on the above grounds would make such a treatment a modified alkaline one. Most clinicians will agree that there is no doubt that its addition has a distinctly beneficial action, and the experiments to be described later afford additional evidence on this point.

5 The good results reported by some observers from the treatment of malaria with euquinine (quinine ethyl-carbonate) possibly depend on the fact that this is not an acid salt, and would therefore not tend to lower the alkali reserve, but it is doubtful if the small amounts of alkali in medicinal doses of the drug would have any effect in raising the reserve.

6 The addition of sodium bicarbonate to quinine has been recommended in cases of quinine idiosyncrasy which according to many workers, is of the nature of an "anaphylactoid" phenomenon, and the use of alkalies would seem to alleviate the symptoms of gastro-intestinal disturbance produced by acid quinine salts.

7 It is interesting to note that there is a patent medicine, popular in some parts of India, which is composed of about 75 per cent of sodium bicarbonate and 25 per cent of quinine.

DISCUSSION OF THE THEORETICAL BASIS OF THE ALKALI TREATMENT

From the above considerations it would appear probable that the combination of alkalies with quinine would be beneficial in one or more of the following ways —

(a) By assisting the natural defences of the body

(b) By alleviating the symptoms of the malarial paroxysm, if these are of the nature of the "anaphylactoid" symptoms of protein shock

(c) By combating any tendency to "acidosis" or diminished alkali reserve

(d) By making the reaction of the body fluids more favourable to the optimum parasitocidal action of the quinine

(e) By helping to alleviate the symptoms of cinchonism

James(15) in 1922 stated "Another ancient practice is to give alkalies (preferably bicarbonate of soda) to reinforce the action of quinine. We have nothing but praise for this practice which receives support from certain laboratory evidence, tending to suggest that to obtain the greatest effect against malarial parasites we should endeavour to make the

blood as alkaline as possible while quinine is circulating in it."

It may be said in objection to the above considerations that the reaction of the blood is constant and cannot be altered appreciably, but most of the experiments which have been done on the reaction of the blood up to the present have reference almost entirely to the reaction of the peripheral blood, we have as yet little or no knowledge of the reaction of the blood in the internal organs, more especially when such organs are in a state of congestion.

Dale and Evans(16) in the case of the cat have changed the pH of the peripheral blood from 7.48 to 7.82 in 20 seconds by excessive ventilation of the lungs, and the same workers by the intravenous injection of sodium bicarbonate changed the pH from 7.22 to 7.73, it is clear therefore, that the reaction of the peripheral blood can be altered by artificial means.

As alkali taken by the mouth would presumably enter the system through the portal circulation, it is interesting to note that Evans, who estimated the reaction of the portal blood in animals for Acton(11), found it less alkaline than the peripheral blood, it would appear, therefore, that by giving alkalies by the mouth we would probably make the reaction of the portal blood, if not that of other parts of the body, more favourable for the antiparasitocidal action of quinine. In the congested state of the internal organs in the malarial paroxysm there would tend to be an accumulation of the acid products of metabolism in the capillaries of these organs, so hindering, locally at least, the optimum effects of the quinine, possibly the reason why the malarial parasite disappears more quickly from the peripheral blood than from the internal circulation after administration of quinine is that the reaction of the peripheral blood is more favourable for the action of the drug. Observations of the reaction of the blood of the liver, spleen and bone marrow, where the malarial parasite apparently survives after its disappearance from the peripheral blood, are urgently needed.

The first idea that occurs to one in considering the above evidence is that the ideal might be found in an alkaline salt of quinine, but, as already pointed out in the case of euquinine, it is doubtful whether the amount of alkali contained in medicinal doses of such a drug would have any appreciable effect in raising the alkali reserve, and the expense of manufacture of such drugs would probably make their price prohibitive for use on a large scale.

Since I commenced this line of treatment Ziemann, in a discussion on a paper by Michaelis(17) on the enhanced lethal action of quinine on bacteria in an alkaline medium, suggested that what was needed in malaria

was to obtain an alkaloid which would have its optimum action on the malarial parasites at the pH of the body fluids. This is perhaps the ideal to be aimed at, but until such a drug is obtained we must use those at present available and, as in the case of alkaline salts, the question of the price of such a new drug has to be considered.

THE TREATMENT OF MALARIA WITH QUININE IN COMBINATION WITH MAGNESIUM SULPHATE AND ALKALIES

In any treatment of malaria for general use there are two points to consider first, that the system of treatment should destroy all parasites in a large percentage of cases, and, secondly, that it should be practicable for use on a large scale.

The essential features of such a treatment are as follows, it must cause a rapid cessation of the patient's symptoms, it must destroy the parasites in the peripheral circulation, and prevent the appearance of sexual parasites, so making it impossible for the patient to act as a carrier, it must prevent the recurrence of clinical symptoms with the reinvasion of parasites, it must prevent the occurrence of "quinine-fast" parasites, if such really do occur, and finally, it must cause no harm to the patient. For popular use in India we might add to these, quickness of action and cheapness.

In any large scale treatment in India we must rule out as impracticable all methods of administration of quinine except the oral one. In all my experiments I have, so far, given quinine by the mouth and sodium bicarbonate has been the alkali of choice on account of its cheapness.

SUMMARY OF TREATMENT

By giving three preliminary doses of alkali before the commencement of quinine treatment it was hoped to combat any "acidosis," to alleviate "anaphylactoid" symptoms, and to make the blood reaction more favourable for the antiparasitic action of the quinine when given. The reasons for using citric acid and magnesium sulphate have already been explained.

As the malarial parasite is believed to be most vulnerable immediately after sporulation has occurred, the length of treatment was fixed at one week so that in the case of the tertian fevers, at least, quinine would be present in the blood in curative doses on at least three occasions when the parasites were sporulating.

It is quite probable that in more chronic cases such a very short course of treatment may not eliminate all the parasites in the internal organs, such as the spleen, where in its enlarged and congested state the reaction of the blood might be very unfavourable for the

action of the drug. In such cases it is probable that two or three courses each of a week of treatment, with weekly intervals, would be needed to obtain the best results. In the intervals a tonic mixture should be given.

The following mixtures were used in the treatment —

Alkaline Mixture

Sodium bicarbonate	60 grains
Sodium citrate	40 grains
Water to	1 ounce

Quinine Mixture

Quinine sulphate	10 grains
Citric acid	30 grains
Magnesium sulphate	60 grains
Water to	1 ounce

The above quantities represent one dose of each mixture. The alkaline mixture is not a solution so the bottle should always be well shaken before the mixture is used.

In the earlier experiments (Table 1 and Table 2 Q A and Q M S 1) 10 minims of dilute sulphuric acid was used in the quinine mixture instead of the citric acid.

When a case was diagnosed microscopically to be malaria the patient was given 3 grains of calomel followed by one ounce of magnesium sulphate dissolved in an equal amount of warm water.

On the next morning one dose of alkaline mixture was given at 7-30 a.m. repeated at 9-30 a.m. and again at 11-30 a.m. Fifteen to thirty minutes after this last dose of alkaline mixture one dose of quinine mixture was given. At 6 p.m. another dose of alkaline mixture was given, followed after fifteen to thirty minutes by a dose of quinine mixture.

For the next four days one dose of alkaline mixture was given thrice daily (i.e. 7-30 a.m. 11-30 a.m. and 6 p.m.) and was followed on each occasion by another dose of quinine mixture, after the interval indicated above. On the following two days the treatment was given twice daily.

This completes the quinine treatment of the case the amount of quinine given being 180 grains in seven days.

In the case of women and where there is much gastric disturbance each dose of alkaline mixture may be replaced by a mixture containing 2 drms of sodium citrate in 2 ounces of water taken slowly. In cases with much vomiting it may be necessary to give a dose of tincture of opium before treatment, or in very severe cases an injection of morphia, but I have never had occasion to resort to the latter measure.

In severe cases a dose of alkali followed by a dose of quinine after the usual interval may be given at once without waiting for the effect of the purgatives, but in these cases the alkaline treatment should be continued in the

intervals between the doses of quinine until the urine becomes alkaline

In severe cases of malignant tertian malaria the amount of sodium bicarbonate in the alkaline mixture was increased to 90 grams dissolved in 2 ounces of water

DETAILS OF THE EXPERIMENTS

The cases here recorded were prisoners in the Lahore Central Jail. All were diagnosed by blood examination before the commencement of quinine treatment

The cases of benign tertian malaria were placed in a different series from those of malignant tertian, such a division being necessary as the two infections are not equally amenable to treatment

Each series was sub-divided into an experimental and a control group. In order to exclude any possibility of personal bias in the distribution of the cases between these groups, they were placed, as diagnosed, alternately and in strict rotation in each of the groups

The use of control cases treated at the same times and with the same amounts of quinine excluded the possibility of variations in cure rate due to season and gave one a standard with which to compare the results obtained, as there are no records of experiments conducted on similar lines amongst Indian patients

The blood of these cases was examined again at the end of treatment and at the end of each week for eight weeks after completion of treatment, this eight weeks' period being that used by Stephens and his co-workers (18) and by Rennie Acton, Curjel and Dewey (19) in their extensive researches into malarial relapses, the term "relapse" in these cases being defined as the reappearance of parasites in the peripheral blood, whether associated with clinical symptoms or not. This method of estimating the "relapse" rate in malaria seems to be the most scientific yet employed and Karl Pearson has calculated from figures supplied by Acton (20) that by this method 94 per cent of the total relapses in benign tertian malaria can be detected

In my observations I have only included as "non relapse" cases those which completed the full eight weeks of observation

In my work I have taken any temperature of 99.5°F or over as "fever" and in every case with "fever" the blood has been examined daily for at least three days during which time only symptomatic treatment was given and no quinine was administered unless malarial parasites were found. In this way it was found that many cases of "fever" which might on clinical grounds alone have been diagnosed as "malarial" were due to other causes

Care was taken that no cases of "fever" occurring in the jail received quinine, unless diagnosed as malaria by blood examination and that none of the patients received any during the eight weeks period of observation. When prophylactic quinine was started in the jail precautions were taken that none of the patients who had not completed their eight weeks observation, received it

In testing the effects of any treatment of malaria in India one must remember that the recorded results of what may be an excellent treatment may be vitiated by reinfections and also by febrile disturbances, which may clinically appear to be "malaria" but which are due to other causes

The cases recorded here were treated during the months of June to November 1922, so it is very probable, as this is the malarial season in Lahore, that a number of the cases recorded as "relapses" were really reinfections. From the beginning of September to the beginning of November no new cases were kept under blood observation for eight weeks as the chances of reinfection were considered too great, but cases were observed for the effects of the treatment on the disappearance of parasites and on the symptoms

The precautions to be taken in such an enquiry are to see that the mixtures actually do contain the quantities of the drugs ordered, that the doses are actually given and that, if given, they are not vomited either voluntarily or involuntarily

RESULTS OF EXPERIMENTS ON TREATMENT

A Effects of treatment on relapse

(1) Benign tertian malaria (Table I)

The first series of cases treated along the above lines were given only four days of treatment (110 grains of quinine), and the mixtures used were similar to those noted above except that dilute sulphuric acid was used instead of citric acid

The experimental cases of this series (Q S Alk in Table I) were treated with these mixtures, whilst the control cases (Q M S 1 in Table I) treated at the same time were given the same quinine mixture in the same doses, but no alkali. We are therefore comparing an alkaline treatment against a less alkaline one for as explained above the addition of magnesium sulphate to the quinine mixture has probably to a certain extent, the same effect as the administration of alkali

Table I shows that the relapses in the Q S Alk series were about 28 per cent, whilst in the Q M S 1 series they amounted to 40 per cent

The second series was treated with the same mixtures but over a period of seven days (180 grains of quinine) and in these the alkaline series had 22.2 per cent "relapses" as compared with 42.8 per cent in the less alkaline

TABLE I.
SUMMARY OF THE RESULTS OF TREATMENT IN BENIGN TERTIAN MALARIA
(The control cases are shown in **antique**.)

SERIES 1							
Treatment	Total cases	Actual number of relapses			Percentage of relapses		
		B T	M T	Total	B T	M T	Total
Q S Alk (110 grs Q in 4 days)	43	12		12	27.9		27.9
Q. M. S. 1 (110 grs. Q. In 4 days)	45	18		18	40.0		40.0
SERIES 2							
Q S Alk (180 grs Q in 7 days)	18	2	2	4	11.1	11.1	22.2
Q. M. S. 2 (180 grs. Q. In 7 days)	14	3	3	6	21.4	21.4	42.8
TOTAL OF SERIES 1 AND 2							
Q S Alk	61	14	2	16	22.9	3.3	26.2
Q. M. S. ..	59	21	3	24	35.6	5.1	40.7
SERIES 3							
C. F Alk (120 grs in 4 days)	18	3	4	7	16.6	22.2	38.8
C. F. (120 grs. in 4 days)	16	7	2	9	43.7	12.5	56.2

series, but the number of cases treated is very small

In this series it will be noted that some cases, originally diagnosed as benign tertian malaria, "relapsed" as malignant tertian. Whether these cases were originally undiagnosed mixed infections or were reinfections during the eight weeks of observation it is impossible to say, but as they were under observation during a period when the number of infections with malignant tertian malaria was on the increase, it seems probable that some at least of them were reinfections. In the appendix I have shown all these cases as "relapses," but if one had considered some at least of them as reinfections the relapse rate would have been even less than that recorded.

The third series were treated with "cinchona febrifuge" and received the usual preliminary purgation but no daily magnesium sulphate. The experimental cases of the series (C F Alk in Table I) were given about 120 grains of "cinchona febrifuge" as tablets during a period of four days combined with the usual alkaline treatment while the control cases (C F in Table I) were given the same amount of the febrifuge but not alkali. The difference between the two series is about 18 per cent in favour of the alkaline treatment.

The relapse rates in the cinchona febrifuge experiments compare favourably with those in the quinine ones and it is possible that if this drug were given in a mixture with magnesium sulphate the results in benign tertian malaria might be very good indeed. Such a

result would be of great practical importance as the febrifuge only costs about one-fifth the price of quinine sulphate. The number of cases recorded is, of course, too small to generalise on, but would indicate the necessity for a further trial of this drug.

The figures in the tables are given as percentages for the sake of comparison, the number of cases is as yet too small to afford a final estimate of the value of the treatment.

(2) Malignant tertian malaria (Table II)

The fourth series (Q S Alk in Table II) was treated in a manner similar to the Q S Alk series of benign tertian malaria detailed above, the control series (Q M S) as in the Q M S 1 series, i.e., a total of 110 grains of quinine during four days in a dilute sulphuric acid and magnesium sulphate mixture. It will be seen from Table II that there is an even greater difference (30 per cent) between the "relapse" percentages of the alkali cases and the controls than in the benign tertian series. As in the case of the second benign tertian malaria series noted above there were some cases which "relapsed" as benign tertian malaria. This was to be expected because these cases were treated chiefly during June and July when the chances of reinfection with benign tertian malaria were great. The remarks which have been made about the malignant tertian "relapses" in cases diagnosed as benign tertian malaria apply to these cases also.

At the beginning of November when the chances of reinfection were small in Lahore a new series of cases (series 5) were started

These cases were treated with the quinine-citric-acid-magnesium-sulphate mixture, whilst the control cases were given a simple solution of quinine sulphate in dilute sulphuric acid similar to the ordinary acid quinine mixture used in the hospitals of this country. The preliminary purgation was the same in both the experimental and control cases but no daily magnesium sulphate or alkali was given to the control cases treated at the same time, so here we are comparing an alkaline treat-

total of 120 grains of quinine being given. Of 5 cases in the alkali series only one relapsed against 4 out of 5 cases in the non-alkali series.

(3) Miscellaneous cases of malaria

In addition to the above cases, 84 other cases of malaria were treated among the staff of the jail and their families. All these cases were diagnosed microscopically but were not examined weekly for blood parasites after treatment.

TABLE II

SUMMARY OF RESULTS OF TREATMENT OF MALIGNANT TERTIAN MALARIA

(The control cases are shown in **antique**.)

SERIES 4

Treatment	Total cases	Actual number of relapses			Percentage of relapses		
		B T	M T	Total	B T	M T	Total
Q S Alk (110 grs Q in 4 days)	27	2	8	10	7.4	29.6	37.0
Q M. S (110 grs Q in 4 days)	25	2	15	17	8.0	60.0	68.0

SERIES 5

Treatment	Total cases	Actual number of relapses	Percentage of relapses
Q C Alk (180 grs of Q in 7 days)	52	8	15.4
Q. Acid (180 grs of Q in 7 days)	53	42	79.2

SERIES 6

Q C Alk (120 grs of Q in 3 days)	5	1	20
Q Acid (120 grs of Q in 3 days)	5	4	80

SERIES 7

TREATMENT			TREATMENT		TREATMENT	
110 grs Quinine Sulph with Mag Sulph and Alkali			210 grs Quinine Sulph with Mag Sulph and Alkali		110 grs Quinine Sulph. in acid sulph. dil mixture	
Total cases	Relapses		Total cases	Relapses	Total cases	Relapses
B T	32	6	12	2 (M T)	2	2
M T	6	1	34	0	1	1

ment with a non-alkaline one, not with a modified alkaline one as in the previous experiments.

As will be seen from Table II there is a very great difference between the two sets of cases in this series, the results being 60 per cent better in those receiving alkali.

Another small series (series 6) was treated with the same mixtures but received 15 grains of quinine in each dose instead of 10 grains, and the total treatment only lasted three days, a

Their blood was examined if they had any clinical signs of relapse and at the end of the eight weeks observation period.

These cases received from 110 to 210 grains of quinine during their week of treatment; the results are shown in Table II series 7.

Of 44 cases of benign tertian malaria only 8 "relapsed," and among 40 cases of malignant tertian malaria only 1 "relapse" was recorded, whilst all 3 non-alkali cases all relapsed.

The doses were 10, 10, 25, 50, 50, 100, 150, 150, 150 and 150 mgms or a total of 0.845 gramme.

The condition of the patient was absolutely unaffected by the treatment, but the delay in the administration of the specific treatment had allowed the disease to progress so far that the child's condition was now critical.

19th December, 1922—Spleen puncture showed L-D bodies still present.

21st December, 1922—Treatment with sodium antimony tartrate was commenced. Six intramuscular injections, 0.5 cc. to 2 cc. of a 2 per cent solution were given and when the patient's condition improved slightly the usual routine course of intravenous injections was commenced.

The patient progressed very satisfactorily under this treatment and was eventually discharged cured on 28th March, 1923, after receiving 185 grammes of tartrate in 40 injections.

Case 3—Hindu male, aged 10, weight 39 lbs.

This boy's condition seemed very good, although he had been suffering from kala-azar for about 6 months. There was no albumen in his urine.

30th November, 1922—Treatment with "Bayer 205" was commenced. This was given intravenously in a 5 per cent solution over a period of 26 days. Doses of 25, 50, 100, 150, 200, 200, 250, 200, 220, and 200 mgms were given, or a total of 1.595 grammes.

After the last dose the temperature, which had been a high remittent one, became a high continuous one for a few days. The condition of the patient was now distinctly worse.

28th December, 1922—L-D bodies were still present in the spleen puncture smear. The patient commenced to show signs of cancrum oris and his condition was so bad that antimony tartrate had to be administered with great caution. He improved slowly and is now quite cured, although he still has a very deep scar where his cheek sloughed. Discharged cured on 8th May, 1923, after receiving 2.08 grammes of Na Sb tartrate in 40 injections.

Case 4—Hindu male, aged 12 years, weight 54 lbs.

A comparatively mild case of kala-azar of 6 months' duration. His urine contained no albumen.

11th December, 1922—Treatment with "Bayer 205" was commenced. A 5 per cent solution was given intravenously in doses of 100, 200, 200, 225 and 200 mgms on alternate days, a total of 0.925 gramme being given.

The condition of the patient became progressively worse during the course of the treatment and after the fifth injection as the temperature was high and continuous it was thought advisable to discontinue the treatment.

L-D bodies were still present in the spleen material.

These results were so discouraging that we reported them to Messrs Bayer and decided to await their reply before making any further experiments.

In the meantime Dr Warrington Yorke (1923) reported a case which he claimed to have cured with "Bayer 205" injections. He gave as a primary dose 0.25 gramme, a larger dose than that which had proved rapidly fatal to Dr Mollow's case, and a total of 2.75 grammes in 4 doses. The patient, who had previously been treated with antimony tartrate rectally and was showing very distinct signs of improvement before the "Bayer 205" was given, continued to improve. He was discharged apparently cured a month later.

Although it was by no means clear that this case had been cured by "Bayer 205," I felt that

this more successful precedent of the administration of larger doses in this disease justified my making another attempt, and I thought it just possible that my previous failure had been caused by my administering too small primary doses. Two suitable cases were selected, both young adults, microscopically proven cases of kala-azar. Neither case was debilitated and in both cases an excellent prognosis would have been given, provided that adequate antimony treatment were carried out.

Case 5—Bengali male, aged 20, weight 81½ lbs.

Condition fair, temperature moderately high, remittent type. A trace of albumen in the urine.

4th April, 1923—Treatment with "Bayer 205" was commenced. A 5 per cent solution was given intravenously in doses of 0.25, 0.5, 1.0, 1.0, 1.0 and 1.0 grammes on alternate days, or a total of 4.75 grammes.

The condition of the patient became much worse, the temperature rising to 104 degrees.

10th April, 1923—Spleen puncture showed the presence of large numbers of L-D bodies.

21st April, 1923—Intravenous treatment with sodium antimony tartrate was commenced.

22nd July, 1923—The patient was discharged apparently cured after receiving 3.45 grammes of sodium antimony tartrate, totalling 3.45 grammes.

Case 6—Bengali male, aged 24 years, weight 87 lbs.

The condition of the patient was fair, he had a high remittent type of temperature. There was no albumen in his urine.

29th March, 1923—Treatment with "Bayer 205" was begun. A 5 per cent solution was given intravenously in doses of 0.25, 0.5, 1.0, 1.0, 1.0, 1.0 and 1.0 grammes on alternate days, or a total of 5.75 grammes.

The condition of the patient was unchanged by the treatment.

14th April, 1923—Spleen puncture showed the presence of L-D bodies.

15th April, 1923—Treatment with sodium antimony tartrate was commenced. He responded to this treatment slowly. His temperature did not come to normal until after the 14th injection, and after this it was irregular, rising to 100 degrees occasionally until within one week of discharge.

7th July, 1923—Discharged apparently cured after 41 injections totalling 3.65 grammes.

The result of the treatment of these two cases with "Bayer 205" was again very disappointing, and the subsequent difficulty that we experienced in curing them even when they were treated with antimony tartrate suggests that they may have been made "resistant" by their previous treatment.

SUMMARY OF RESULTS

Case	Age	Weight in lbs	Initial dose in grammes	Total amount in grammes
1	30	83	0.01	2.115
2	2½	24½	0.01	0.845
3	10	39	0.025	1.595
4	12	54	0.1	0.925
5	20	81½	0.25	4.75
6	24	87	0.25	5.75

It will be seen that in proportion to their weight two of these cases had slightly less of the preparation than Dr Yorke's case (weight 93 lbs), two had rather more and two had considerably more.

This complete failure of the preparation in six consecutive cases can only lead to the

conclusion that "Baver 205" is valueless in the treatment of kala-azar. Thus one more drug with marked trypanosomicidal properties is added to the long list of failures in the treatment of leishmaniasis.

I am indebted to Friedr Baver & Co for supplying the "Baver 205" and for their subsequent permission to publish this adverse report and also to Lt-Col J W D Megaw, I.M.S. for giving me the opportunity of trying the preparation.

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OBSERVATIONS ON AN OUTBREAK OF DIPHTHERIA AT BISHOP COTTON'S SCHOOL, SIMLA

By E S PHIPSON DSO MD (Lond)

DPH, DTM., & H MAJOR, I.M.S.,

Health Officer Simla

*With Special Reference to the Carrier Problem**

I INVESTIGATED this outbreak in co-operation with Lieutenant-Colonel F W Sumner I.M.S., Civil Surgeon, Simla E., and Medical Officer of the School and I am indebted to him for much of the information regarding the epidemic.

Origin and Course of the Outbreak

The origin of the outbreak is clearly traceable to a boy who arrived at the beginning of March 1922 when the school re-assembled after the winter vacation. This boy developed a sore throat on the 4th of March and was suffering during the journey to Simla from a mild but recognisable attack of diphtheria. On arrival he was at once admitted to hospital on the 14th March. This boy whom I will call A was accompanied on the journey from Karachi by a number of other boys from the same part of India and all bound for the same school. Of these boys, 7 (B C D E F G and H) developed diphtheria between the 20th and the 31st of March. All these cases were of a fairly mild type and the diagnosis in all except the last was confirmed bacteriologically in my laboratory. At the beginning of April the entire school was given a prophylactic dose of diphtheria anti-toxin, (1,000 units).

On the 19th of May a ninth case (I) was reported. The occurrence of this case seemed to point to the fact that some of the 8 boys (A—H) might be intermittent carriers. They were accordingly swabbed for three successive days with the result that 4 of these 8 boys, i.e., (A B C and G) were found to be intermittent carriers. These four boys were segregated and local treatment applied. They were

again examined a fortnight later when it was found that A and B had apparently ceased to be carriers but C and G were still carrying. A third series of examination was made after the lapse of another fortnight, which apparently eliminated G and left only C who after this investigation, alone remained in segregation the others returning to school.

It thus appeared as if the carriers had been accounted for. Early in July however two more cases (J and K) occurred and the diagnosis was confirmed. As the only known carrier was then segregated this indicated the probability of a hitherto unrecognised focus of infection, and I formed the opinion that this focus might still be persisting among the boys of the original group who had been allowed to rejoin the school on the strength of a negative three-day test. I accordingly submitted the original group (A—H), together with a number of boys who were contacts of these boys to a six-day test with the result that in addition to C who was known to be a chronic carrier, three boys (A F and H) who had previously passed the three-day test could not pass the more severe six-day test. No other carriers were then found among the contacts examined at the same time. All these carriers were segregated.

The next case (L) occurred at the end of August, also confirmed bacteriologically. Inquiries pointed to the fact that the boy (L) had contracted the disease by unauthorised communication with the boy (A) who was a chronic carrier in segregation.

About the middle of September three more bacteriologically positive cases occurred which could not be attributed to infection from any of the known carriers, and pointed to an unknown source of infection. After consultation with the Medical Officer of the school it was decided to advise the Governors to close the school as early as practicable and to make use of the intervening time by a thorough clinical examination by the School Medical Officer of the throats of the whole school, including the teaching, domestic and menial staff. This revealed the fact that out of about 200 boys, 59 had more or less unhealthy throats. Nothing wrong was found with the staff. These 59 boys were then subjected to a six-day test, and 36 were found to be carrying bacilli resembling B diphtheriae. It is possible, of course, that these 36 boys were not true contact carriers, but carriers previously existing in the school who had no connection with the outbreak. A case has been recorded where a presumably healthy school population numbering 800 was shewn to contain nearly 20 per cent of carriers†.

* An abstract of a paper read before the Medical Research Section of the Indian Science Congress, Lucknow, January, 1923.

† Ministry of Health Reports on Public Health and Medical Subjects, No 10 of 1921.

Period of infectivity in convalescent carrier cases

These were as follows —

Case	Date of onset of disease	Date of last known positive finding	No of days carrying
A	4th March 1922	5th July 1922	123 days
B	20th March 1922	28th May 1922	68 "
C	20th March 1922	28th June 1922	99 "
F	23rd March 1922	10th July 1922	106 "
G	31st March 1922	12th June 1922	73 "
H	31st March 1922	20th July 1922	120 "
			Mean 98 days or 14 weeks

None of the other cases proved to be chronic carriers

It is important to record that in a large proportion of the six-day tests, positive findings were obtained very irregularly, only once or twice out of the six tests, and, a six-day test being of course a purely arbitrary measure, no doubt a larger number of tests would have produced a larger number of positive findings

The relationship of the two classes of carriers to the spread of the disease

It will, I think, be conceded that in general terms a convalescent carrier is much more infective than a contact or healthy carrier. In this particular outbreak, however, cases continued to occur even after all convalescent carriers had as far as possible been disposed of, and enquiry shewed that at one time there were not less than 36 contact carriers or 18 per cent at large in the school. Modern opinion appears to be agreed that the great majority of the bacilli recoverable from contact carriers are non-virulent and harmless. Even if the bacillus can be successfully isolated in pure culture from such cases, a matter which presents in many cases no little difficulty, it is hardly possible in a small laboratory to apply fermentation and virulence tests to all strains recovered from such cases, and what seems to be required is a compromise between what is scientifically desirable and what is practicable. The use of the Schick reaction followed in cases proved to be susceptible, by toxin-anti-toxin inoculation appears to have been of great value in school outbreaks in America and in the United Kingdom. I am not aware whether it has been systematically employed in India, but such information as I was able to obtain did not encourage me to recommend its use until further evidence is available that it can be safely employed in this country.

Various methods of dealing with carriers have been advised, some of them verging on the heroic —

- (1) Local treatment with antiseptic sprays or gargles. This method was adopted in the Simla outbreak, but it is of doubtful value.
- (2) Local treatment with polyvalent anti-microbic serum.
- (3) Spraying the throat with cultures of pyogenic organisms.
- (4) Inoculation with diphtheria endo-toxin.
- (5) Inoculation with diphtheria vaccine, plain and detoxicated.
- (6) Enucleation of the tonsils.

I have no personal experience of any of the methods detailed except the first. Apart from enucleation of the tonsils in chronic carrier cases which is said to be an effective if drastic method of treatment, the use of a bacterial vaccine seems to me to hold out the greatest prospect of success, but the only evidence I can find of its efficacy is that of Brownlie* who stated that 44 out of 50 carriers were freed from bacilli after three doses of a stock bacterial vaccine. In this instance the criterion of success was two successive negative throat swabs, which, in view of my experience recorded above, I find it hard to accept as conclusive.

Conclusion

From the point of view of the practical hygienist, the present position as regards diphtheria management is unsatisfactory. It is evident that in searching for carriers the number discoverable is not an absolute quantity, but is largely dependent on the time and care which can be devoted to the search, convalescent carriers when recognised, possibly require prolonged treatment of a nature yet to be determined and accepted, contact or healthy carriers may exist in large numbers, persist for an indefinite time and represent a danger to the community indeterminate in degree, but commonly assumed to be more or less negligible.

On the one hand we find some authorities advocating prolonged and elaborate examinations of carriers with a virulence test in each, on the other we find bacteriological examination discarded in favour of examination on a clinical basis plus a time limit. In Prussian schools the current regulation provides that no diphtheria carrier if otherwise healthy is to be excluded from school longer than 8 weeks after clinical recovery*.

For routine work some standard procedure is necessary. Many parents can ill afford the expense of keeping a boy in hospital while elaborate carrier investigations are in progress.

* Ministry of Health Reports on Public Health and Medical Subjects, No 10 of 1921

but to return a known carrier from hospital back to school, even to a segregation ward, is not without risk to others. In either case the loss of three or four months school time may be a serious matter educationally.

In view of the findings recorded above in which 15 cases produced 6 carriers I am inclined to think that if found to be practicable, a more logical method of institutional diphtheria management would be to proceed *ab initio* on the assumption that every case of diphtheria will ordinarily become a carrier and, as soon as the clinical condition permits of it, to endeavour to exalt the bacteriolytic powers of the patient's blood by administering as a routine suitable doses of polyvalent bacterial vaccine combined, perhaps, with a direct attack on the strongholds of the bacillus by cauterisation of the crypts of the tonsils thus dealing with an assumed carrier condition during convalescence from the clinical disease.

Acknowledgments

I am indebted to my assistant Assistant Surgeon A C Victor, I M D, for his valuable work in connection with this investigation. The epidemic involved the examination of nearly 700 separate cultures from throat swabs, most of which were taken in the Health Department laboratory at a time when the ordinary routine work was unusually heavy.

THE SCHICK TEST AND IMMUNISATION BY TOXIN-ANTI-TOXIN IN ASSAM

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SHILLONG is the administrative capital of the Province of Assam and is a hill station, in which there are three schools for European children. During the school season, these schools receive pupils as boarders, who come from all over India.

In 1917 a serious outbreak of diphtheria occurred in one of these schools, when 40 cases of diphtheria occurred with two deaths. Since then, in spite of scrupulous attention to school hygiene, isolation of cases and search for contact carriers, there has been an annual crop of diphtheria cases which has caused so much trouble to the school authorities and so much anxiety to parents that fear of these outbreaks was tending to empty the schools.

The actual number of cases occurring is shown below —

TABLE I

Year	Number of cases of diphtheria
1917	40
1918	16
1919	2
1920	3
1921	26

Before describing the work done by us in Shillong it may be of interest to give brief details of the Schick test, and toxin-anti-toxin immunisation as carried out in America and England.

SCHICK TEST

It is well known that this test determines by a local reaction, or its absence whether an individual is or is not, susceptible to diphtheria.

That the reaction is specific may be judged from the following —

(a) Schick has found that those giving a negative reaction have at least $1\frac{1}{30}$ th of a unit of natural diphtheria anti-toxin in their blood, sufficient to protect them from an attack of diphtheria, whilst those giving a positive reaction have less than this amount of diphtheria anti-toxin or none at all in their blood. This has been confirmed by other workers.

(b) The Schick reaction is found to be negative in cases which have recently been given diphtheria anti-toxin, and in cases where the anti-toxin has been given at the same time as the test.

(c) Cases giving a negative reaction do not develop diphtheria, even when exposed to infection. Thus Zingher(1) states, of 2,200 scarlet fever patients who gave negative reactions on admission to the Wellard Parker Hospital, none developed diphtheria though they were exposed to cases of diphtheria among the Schick positive patients, even though some of them became carriers of virulent diphtheria bacilli during their stay in hospital.

In 500 cases tested by Leete(2), eleven cases developed diphtheria. Of these, ten were among cases who gave a positive Schick reaction, and one was a case who gave a doubtful reaction.

Judging by the results of the Schick test, the susceptibility to diphtheria varies with age. The following figures of Park and Zingher(3) are based on many thousands of cases tested.

TABLE II

Age.	Susceptible per cent
3 to 6 months	30
6 months to 1 year	60
1 to 2 years	70
2 to 3 years	60
3 to 5 years	40
5 to 10 years	30
10 to 20 years	20
Over 20 years	12

Four types of reactions are met with(4)

(1) Positive reaction — Those having less than $1\frac{1}{30}$ th unit of natural diphtheria anti-toxin per c c in their blood.

(2) Negative reaction—Those having at least 1/30th unit of anti-toxin per c c in their blood

(3) Pseudo-reaction—Those reacting to the bacillary protein but not to diphtheria toxin

(4) Pseudo and positive-combined reaction Those reacting to both the diphtheria toxin and the bacillary protein

Toxin-Anti-toxin Immunisation—This consists of three injections at weekly intervals of 1 c c of diphtheria toxin, suitably neutralised with anti-toxin. The actual strength of the mixture employed is 85 per cent L dose of toxin per unit of anti-toxin

As to the immunity conferred, the following figures are of interest—

Bauer(5) immunised 1,100 children with the toxin-anti-toxin mixture who were found to be susceptible to diphtheria by the Schick test. Two hundred of these were re-tested after five months and all gave a negative test

Park, quoted by M Garcia Bonus(6), found 95 per cent immunised after three injections of toxin-anti-toxin. These were among many thousands of cases done

Schroedar(6) immunised 50,000 school children at Brooklyn, New York. After two years, 570 children were re-tested, of whom 92.4 per cent were found to be immunised

The length of time immunity lasts is not quite certain, but it is at least 5½ years and probably for life. Schroedar(6) has re-tested certain children yearly for over 5 years and found no variation in their immunity. Park(6) has tested cases 5 years after they were immunised and found them still immune

TESTS DONE IN SHILLONG

Having decided to test all the school children by the Schick test and to immunise those found positive with toxin-anti-toxin, it was discovered that the materials were not obtainable in India. Owing to rapid deterioration of diluted diphtheria toxin when exposed to heat or light it is not stored in the tropics. Undiluted toxin is more stable, but will not stand a temperature of 37°C for many days

Negotiations were opened however with an American firm by the Director of Public Health for the supply. It was received in April 1922, and put into cold storage immediately, and the following tests carried out (by E C R F)

The toxin for the Schick test was received in capillary tubes, each capillary tube containing sufficient for ten tests. As each test requires 1/50 M L D, each capillary tube contained 10/50 of one M L D

1st Experiment

Guinea pig weighing 250 grammes was inoculated subcutaneously with the contents of five capillary tubes representing one M L D

Result No local reaction, no induration, no signs of paralysis

2nd Experiment

Guinea pig of 250 grammes inoculated as in No 1 with the contents of 10 capillary tubes or 2 M L Ds. Result—Same as No 1

3rd Experiment

Guinea pig of 250 grammes inoculated with the contents of 15 capillary tubes or 3 M L Ds. Result—Same as No 1

This particular diphtheria toxin was thus found to be inert and was not used

Through the kindness of Dr O'Brien of the Wellcome Research Laboratory, a fresh supply of toxin for the Schick test was received and put to the following tests—

The toxin was undiluted and received in capillary tubes. Each tube contained 1 M L D

1st Experiment

(A) Guinea pig (250 grammes) inoculated subcutaneously with 1 M L D S (= contents of one capillary tube)

Result 1st day	Some local induration
2nd day	" "
4th day	Necrosis and sloughing
9th day	Paralysis
11th day	Death

(B) Guinea pig (250 grammes) inoculated with 1 M L D toxin—500 c c anti-toxin given 24 hours previously

Result—No local or general reaction

2nd Experiment

(C) Guinea pig (250 grammes) inoculated subcutaneously with 2 M L D of toxin (2 capillary tubes)

Result 24 hours	Marked induration
48 hours	Necrosis and sloughing
72 hours	Death

3rd Experiment

Intradermal inoculations were done with 0.2 c c of each of the following dilutions of toxin—

(A)	1/50 of 1 M L D (One capillary tube)
(B)	1/250 of 1 M L D
(C)	1/500 of 1 M L D
(D)	1/1000 of 1 M L D

A	Gave a well-marked positive reaction
B	Was positive but less definite
C	Was doubtfully positive
D	Was negative

This Schick toxin, received from Dr O'Brien, was used for all the tests carried out

The toxin-anti-toxin received from America was found potent, i.e., 5 c c injected subcutaneously into a guinea pig weighing 250 grammes caused local induration and paralysis on the 7th day. The test laid down in America is that 5 c c should cause delayed paralysis but not acute death

Of 121 children immunised 74 were done with the American toxin-anti-toxin and the remainder with a supply received from Burroughs Wellcome and Co

The toxin used was diluted immediately before use in the diluent sent out with the toxin, the strength of the dilution being 1/50 of 1 MLD in 0.2 c.c.

One c.c. Roux syringes were used with very fine needles. Both forearms were exposed and sterilised with ether and 0.2 c.c. of the toxin injected intradermally into the anterior aspect of the right forearm. Assistant Surgeon R. T. Sen, L.M.S., assisted the writers in the administration of the injection.

The same quantity of heated toxin, as a control, was similarly injected into the left forearm.

Great care was taken that the injections were really given intradermally and not subcutaneously. Forty to forty-five cases were dealt with at a time, and any diluted toxin left over was thrown away. Fresh toxin was used for each batch.

The arms were examined after 2, 3 and 10 days.

The appearance of a typical positive reaction is quite distinct, and no difficulty was found in judging the reaction even in those with a very dark skin.

Unfortunately, there were some cases in which the reaction was doubtful, and it was not found possible, for want of sufficient toxin, to retest these.

TABLE III

Showing the results of the tests in the three schools

Name of school	Number tested	Number positive	Number of pseudo-reactions		Number doubtful	Percentage positive
			Positive	Negative		
St. Edmund's College	143	57	2	3	6	39.9
Pinemount School	99	21	0	0	2	42.8
Loretto Convent	79	47	2	5	6	59.5
TOTAL	271	125	4	8	14	46.1

TABLE IV

Showing the number of positive Schick reactions and pseudo reactions according to age

Age	No. tested	No. positive	Percentage positive	No. of pseudo reactions
1 to 5 years	11	6	54.5	0
5 to 10 years	97	50	51.5	3
10 to 15 years	137	57	41.6	5
Over 20 years	6	4	66.6	2
TOTAL	271	125	46.1	12

Owing to the small numbers tested these percentages are not of much value.

The pseudo-reactions were more common

among the older children 15 per cent giving a pseudo-reaction above the age of 15 as compared with 3 per cent below that age. This is in accordance with general experience.

EFFECT OF CONSANGUINITY ON THE SCHICK TEST

Of 4 families of 4 children each —

In 2 families 3 were positive and 1 negative

In 2 families 2 were positive and 2 negative

Of 4 families of 3 children each —

In 2 families all 3 were negative

In 1 family all 3 were positive

In 1 family 2 were positive and 1 negative

Of 23 families of 2 children each —

In 9 families both were negative

In 7 families both were positive

In 7 families 1 was positive and 1 negative

Zingher(1) after an analysis of 93 groups came to the conclusion that members of the same family are likely to give the same positive or negative reaction.

TOXIN-ANTI-TOXIN IMMUNISATION

Of 125 children found to be positive, 121 were inoculated with toxin-anti-toxin, and 3 owing to want of material, and one owing to the refusal of the parents were not immunised.

Each child received three injections of 1 c.c. at weekly intervals.

After the first injection, 18 of the older children above 12 years of age had a severe reaction, shown by a rise of temperature to between 101° and 103°F and a painful local reaction.

14 others had a moderate reaction with a temperature up to 100°F. The others, which included all the younger children, suffered no inconvenience. The second and third injections caused no local or general reaction except in those who reacted severely to the first injection in whom the subsequent injections caused a lesser degree of inconvenience.

Two months after the last injection thirteen of the children who had shown a typical positive Schick reaction were retested, and all gave a definitely negative reaction.

RESULTS

In the largest of the three schools containing 144 boys, all were tested with the exception of one, and out of 57 who were positive 56 were immunised. The 57th boy was not immunised owing to the refusal of his parents. This boy developed diphtheria, but made a satisfactory recovery.

At a later date, a boy who had given a negative Schick reaction developed a mild attack of sore throat and virulent diphtheria bacilli were isolated from the swab. We consider that this case may either have been one of septic sore throat in a healthy contact carrier or of modified diphtheria in an immune subject. This case was very mild, the throat clearing up in a day or two after a very small dose of anti-toxin.

Such cases have been met with in America and do quite well without treatment with anti-toxin. In this case virulent diphtheria bacilli persisted in his throat after recovery and resisted all attempts at sterilisation for some months. He was therefore present throughout the season as a carrier, despite which only one other case of diphtheria occurred which by a curious coincidence, was in the person of the one boarder, who by oversight, had not been tested by the Schick test.

No cases of diphtheria occurred in the other two schools.

Thus out of 265 children and 6 adults who were running a risk of diphtheria during the term, there were three cases —

(1) A case of diphtheria in a Schick positive case

(2) A case of septic throat with virulent diphtheria bacilli present in a Schick negative case

(3) A case of diphtheria in a non-immunised boy whose Schick reaction was unknown

CONCLUSIONS

In so far as is known, this is the first attempt to make use of the Schick reaction and toxin-anti-toxin immunisation in India, and our experience seems to indicate that the toxin for the Schick test and the toxin-anti-toxin mixture can, although not always, retain its potency after a journey to India during the hot weather months and give similarly useful results in India to those reported in Europe and America.

Thanks are due to the Irish Christian Brothers who run the School (St Edmund's) in which these measures were initiated, for their enlightened confidence and cordial co-operation in new—and in India untried—measures of prevention and prophylaxis, and also to the Head Mistress of Pinemount School and the Mother Superior of Loretto Convent School for following the lead thus given by St Edmunds. It is satisfactory to record that, as a result of the confidence inspired by these measures, on the opening of the session, all new pupils are now being tested and immunised.

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THE DISSEMINATION OF HUMAN HELMINTHIC INFECTIONS BY ANIMALS

By G C RAMSAY, OBE, M.B, CHB (Edin.)
Labac Central Hospital Dewan P O, Cachar, Assam
COLONEL ANDREW BALFOUR, when delivering
an address at the Royal Sanitary Institute on

April 26th, 1922, stated that recent observation by American workers had shown the pig to be a disseminator of hookworm larvæ.

In the annual report of the work done in the hookworm laboratory of the Calcutta School of Tropical Medicine during 1921, issued by the Indian Tea Association on May 10th, 1922, Dr R Borland McVail writes "In view of the fact that pigs are sometimes alleged to spread hookworm disease, we tried to infect some young pigs by means of larvæ of human hookworm. The results were negative and as the Indian village pig is a natural scavenger and devourer of refuse, including faecal matter, it is probable that the presence of pigs in a village or in garden lines does more good than harm."

In the tea garden practice which I supervise in Cachar it is a very noticeable fact that the most unhealthy gardens are those where coolies are allowed to keep pigs.

My most unhealthy garden, which has usually the unenviable distinction of being on Government's "Black List" has at present a human population of 465, composed chiefly of Bhuiya and Chamar castes, and a pig population of over 200. Practically every coolie on this garden over five years of age shows signs and symptoms of anæmia.

The vital statistics of this garden for the past seven years have been —

Years	Death rate per 1000	Birth-rate per 1000
1916	45.32	31.09
1917	54.92	29.07
1918	91.63	25.72
1919	108.51	31.71
1920	59.92	20.59
1921	70.04	16.26
1922	46.21	29.4

On the garden where I reside, which has a population of over 2,000 coolies, and where they are prohibited from keeping pigs, the vital statistics during the same period have been —

Years	Death-rate per 1000	Birth-rate per 1000
1916	13.21	29.89
1917	12.45	24.31
1918	63.29	22.39
1919	39.6	21.02
1920	16.92	28.52
1921	18.21	28.84
1922	14.07	25.06

To confirm or disprove the theory of the dissemination of hookworm by pigs, I recently carried out the following investigations —

Six pigs purchased from tea garden coolies were slaughtered, their gastro-intestinal tracts were examined for helminths, the gastro-intestinal contents examined microscopically.

for ova and cultures, as recommended by Stitt, made from the rectal contents for larvæ

The following are my findings —

Helminths found in the Gastro-Intestinal Tract on Post-mortem Examination

Stomach	Small Intestine.	Large Intestine
<i>Pig No 1</i>		
Negative	Negative	Negative
<i>Pig No 2</i>		
Trematodes Gastrodiscoides hominis?	Negative	Nematodes in the descending colon, species unrecognised
<i>Pig No 3</i>		
Negative	Negative	Negative
<i>Pig No 4</i>		
Negative	Negative	Negative
<i>Pig No 5</i>		
Negative	Negative	Trematodes, Gastrodiscoides hominis? found in ascending colon
<i>Pig No 6</i>		
Negative	Roundworm re- sembling closely Ascaris lumbrico- ides found in lower part of jejunum	Negative

Microscopic examination of contents of the Gastro-Intestinal Tract

Stomach con- tents	Contents of small Intestine	Contents of large Intestine
<i>Pig No 1</i>		
Hookworm ova	Hookworm ova	Hookworm ova
Roundworm "	Roundworm "	Roundworm "
Whipworm "	Whipworm "	Whipworm "
		Flagellates
<i>Pig No 2</i>		
Hookworm ova	Hookworm ova	Hookworm ova.
Roundworm "	Roundworm "	Roundworm "
Whipworm "	Whipworm "	Whipworm "
Balantidium coli		Balantidium coli
		Flagellates
<i>Pig No 3</i>		
Roundworm ova	Roundworm ova	Roundworm ova
Hookworm "	Hookworm "	Hookworm "
Whipworm "	Whipworm "	Whipworm "
Balantidium coli	Roundworm ovum without mammil- lated sheath.	Balantidium coli
Flagellates		Flagellates

<i>Pig No 4</i>		
Roundworm ova	Roundworm ova	Roundworm ova
Whipworm "	Whipworm "	Whipworm "
Hookworm "	Hookworm "	Hookworm "
Balantidium coli		Flagellates
<i>Pig No 5</i>		
Hookworm ova	Roundworm ova	Hookworm ova
Roundworm "	Whipworm "	Roundworm "
Whipworm "	Hookworm "	Whipworm "
Unfertilized Roundworm ova	Smooth Round- worm ova which have lost their mammillated ap- pearance	Flagellates
<i>Pig No 6</i>		
Hookworm ova	Hookworm ova	Flagellates
Roundworm "	Roundworm "	Hookworm ova
Whipworm "	Whipworm "	Roundworm "
Flagellates		Balantidium coli
		Unfertilized Roundworm ova and Roundworm ova which have lost their warty excrescences

	Culture of rectal contents
Pig No 1	Positive for hookworm larvæ
Pig No 2	" " " "
Pig No 3	Negative " " "
Pig No 4	" " " "
Pig No 5	" " " "
Pig No 6	Positive " " "

In addition to the above, two specimens of fæces of pigs collected in the lines of this unhealthy garden were positive when examined microscopically for ova and in cultures for larvæ

From these observations it will be seen that hookworm ova swallowed by the pigs can pass through the gastro-intestinal tract intact and continue to carry out their life cycle

That the pig is a serious danger to the health of a tea garden community has for many years past been recognised by many tea garden doctors and planters. The reason for the pig being so dangerous in spreading hookworm is that having gorged himself with human fæces from the jungle around the lines, he returns with his infected fæcal-laden bowel to disseminate his helminthic and protozoal infections around the cooke huts

Practically all animals in Cachar eat human faeces, perhaps in virtue of their sodium chloride content, for cows will frequently refuse to drink boiled rice water unless common salt be added. It is a common sight to see cows and sheep licking the soil where coolies have passed urine.

More recent researches with jackals, dogs, sheep, and goats have shown that their stomachs and rectal contents contain hookworm, roundworm and whipworm ova, the faeces being positive for hookworm larvæ in culture.

The faeces of twenty cows belonging to coolies were all negative, but in a cow killed by a leopard I found hookworm ova in the large intestine, from which numerous larvæ hatched out in seven days.

Nematodes, to me indistinguishable from human hookworms, are common in the jejunum of dogs, jackals and sheep. *Trichuris ovis* is common in the caecum of sheep and goats, and *Dipylidium caninum* in dogs and jackals.

These, along with other nematodes, trematodes and cestodes collected during these investigations, are being preserved in lactophenol to send at an early date to a reliable helminthologist for identification.

I have to thank my Indian assistants, Abdul Wodood Chowdhury, Zillur Rahaman Chowdhury and Nripendra Kumar Chowdhury for their great assistance during these investigations.

Since the above article was sent for publication I have performed a further eleven post-mortem examination on pigs.

As in the six pigs already recorded none of these eleven pigs harboured adult hookworms but all had human hookworm, roundworm, and whipworm ova in their stomachs and intestines, human faeces with human helminthic ova being demonstrable in the buccal cavity and oesophagus in most cases.

Cultures which had been kept for over a month showed in two cases (one from a specimen of dog's faeces and the other from a pig) motile larvæ inside the egg sheath of the human roundworm ova which had been swallowed by a dog and pig respectively.

It must be admitted, however, that in the cultures examined practically all human roundworm and whipworm ova which had passed through the gastro-intestinal tract of a second animal failed to segment or were found to be disintegrated.

SOME OBSERVATIONS ON THE DIETARY OF SCHOLARS

By JAHAR LAL DAS, DPH,

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Bihar and Orissa

It is much to be regretted that the question of the dietary of school boarders is not receiving the attention it deserves. An insufficient or unbalanced diet, as we all know, is not only a very serious cause of ill-health but also leads to defective development of the intellect

and is especially detrimental to growing children. The dietary in the hostels attached to the high schools of Bihar and Orissa were found to be defective both in quality and variety, as they were conspicuous by the shortage of protein and fatty constituents and did not contain enough vitamins.

The question of defective nutrition of scholars in Bihar and Orissa was first brought to the notice of the Director of Public Health by the school medical officers in their last annual reports and was promptly taken up by the Public Health Department. I was put in charge of this work by the Director, Lt-Col W. C. Ross, I.M.S., to whom I am indebted for the instructions I received in carrying on the investigations, and any future improvement that may be effected in the dietary of the scholars will reflect credit on the school medical officers whose need and usefulness have been amply justified.

A perusal of the diet statements obtained from the school hostels revealed that the scholars were not getting the quantity of protein and also fat necessary for their healthy growth and development and that the dietary was not sufficiently varied. All the diets were lacking in nitrogenous elements with the exception of the C. M. S. Christian Hostel, Bhagalpur, which—though not wanting in proteins—was rather deficient in carbohydrates and calorific value, (see appendix A).

The dietary in all the hostels consisted essentially of *dal* (pulses) and *bhat* (boiled rice). Generally speaking the diets were not wanting in carbohydrates and caloric values, but were deficient in their proteid constituents to about 25 per cent. They were also lacking in fat and vitamins and rather of a stereotyped nature. It may, however, be stated here that most of the Biharis are vegetarians.

On analysing the diet statements of ten principal hostels (as per appendices B and C) it was found that each scholar had been daily receiving on an average 277 ounces of uncooked food yielding 1410 grains of nitrogen, 37796 grains of carbon and 21244 units of heat energy (calories) at a cost of about Rs 7|8/- a month. The question of cost is an important factor as most of the scholars come from poor families.

A good or well balanced diet should consist of all the classes of foods in proper proportion, and any defect or excess in one should be counter balanced in another or in the course of a week. We know that an Indian adult doing moderate work excretes daily about 250 grains of nitrogen and 4,500 grains of carbon, which he must consume daily to maintain his bodily equilibrium and his health as well. He also requires food yielding about 2,800 to 3,000 calories or units of energy daily. A growing child of school going age, that is

between the ages of 12 to 15 or 16—with whom we are concerned and whose work is also considered to be of a moderate nature,—will require about three-fourths of the adult diet, i.e. he should have about 180 grains of nitrogen and 3,400 grains of carbon to make good his daily loss and also food yielding about 2,000 units of energy. Besides this he requires extra food, particularly nitrogen, for his growth. As all the food consumed is not wholly digested and absorbed it is desirable that its quantity should be somewhat in excess of the requirements, and any undigested matter will help in the regular evacuation of the bowels.

An analysis of the diets referred to above shows conclusively that they are short of protein constituents and fats and therefore require balancing.

The following therefore, is calculated to meet the needs of a scholar —

Foodstuffs	Quantity in ounces	Nitrogen in grains	Carbon in grains	Calories or units of energy
Rice	7	22	1,120	628
Flour or atta	7	56	1,162	700
Pulses or Dal	3	52	500	270
Potatoes	5	7	226	120
Other vegetables	4	6	64	32
Mustard oil	1	0	164	103
Gram or suttu	3	52	500	270
Gur or brown sugar	2	0	173	115
Salts, spices, &c.	1	0	0	0
Total	32½	195	3,904	2,238

This quantity of food (i.e. about 22 ounces) would better be divided into four portions, and the gram after soakage or suttu should be given with a little salt or gur to each boarder in the morning and evening as light refreshments.

This diet costs about Rs 7½/- a month exclusive of the cost of cooking, i.e., charges for cook, servant, fuel, etc., which comes to another couple of rupees, so a total cost of Rs 9½/- or Rs 10/- a month would give a scholar a complete and healthy diet. The diet can also be judiciously modified without adding to its cost to suit a non-vegetarian scholar

or varied by adding fruits which are rich in vitamins.

There appears to be a good field for scientific investigation as to what should constitute an economic but at the same time a perfectly well balanced diet for an Indian scholar for each province, as the habits, customs, food, etc., of the people differ considerably in different provinces. Some very valuable work connected with the dietary of the Bengali students has been done by Lt-Col David McCay, I.M.S., of the Calcutta Medical College, and it is hoped that physiologists in provinces where this problem has as yet not been tackled will soon take up this question, which is not only of great scientific value but also of vital national importance.

APPENDICES

APPENDIX A

C M S Christian Hostel, Bhagalpur, @ Rs 7 per month

Foodstuffs supplied daily	Quantity in ounces daily	Nitrogen in grains	Carbon in grains	Calories
Biscuits (flour)	1½	12	200	148
Rice	8	28	1,400	784
Pulses (dal)	2	32	310	172
Vegetables	4	7	80	40
Meat	8 (?)	116	530	600
Mustard oil	0½	0	165	104
TOTAL	24½	195	2,685	1,868

APPENDIX B

I Sonthal Hostel, Dumka, @ Rs 7 per month.

Foodstuffs supplied daily	Quantity in ounces daily	Nitrogen in grains	Carbon in grains	Calories
Rice	16	56	2,800	1,568
Dal	4	64	620	344
Oil (mustard)	1	0	220	134
Fish	2	26	96	80
Vegetables	4	6	64	32
Spices and salts	1	0	0	0
TOTAL	28	152	3,800	2,158

II Purulia Zila School Hindu Hostel @ Rs 7 per month

Foodstuffs supplied daily.	Quantity in ounces daily.	Nitrogen in grains	Carbon in grains	Calories
Rice	16	56	2,800	1,568
Dal	2	32	320	132
Vegetables	8	12	128	64
Fish	0½	10	38	32
Meat	1	12	48	40
Salts, etc				

TOTAL 27½ 122 3,334 1,796

III Purulia Zila School Muhammadan Hostel @ Rs 7-8 per month

Rice	14	48	2,450	1,372
Dal	4	64	610	144
Vegetables	4	6	64	32
Meat	4	48	192	160

TOTAL 26 166 3,326 1,908

IV Monghyr Zila School Hindu Hostel @ Rs 10 per month

Rice	16	56	2,800	1,568
Dal	4	64	620	344
Vegetables	4	6	64	32
Ghee or oil	2	0	440	268
Fish*	0½	6	24	20

TOTAL 26½ 132 3,948 2,232

* 4 ozs of fish given to each boarder once a week

V Monghyr Zila School Muhammadan Hostel @ Rs 8 per month

Rice	16	56	2,800	1,568
Dal	4	64	620	344
Vegetables	4	6	64	32
Ghee or mustard oil	1	0	220	134
Meat or fish*	0½	6	24	20

TOTAL 25½ 132 3,728 2,092

* Meat or fish 4 ozs supplied to each boarder once a week

VI Raghunathpore H E School @ Rs 5-10 per month.

Foodstuffs supplied daily	Quantity in ounces daily	Nitrogen in grains	Carbon in grains.	Calories
Rice	22	48	3,850	2,156
Dal	3	40	460	260
Vegetables	5	8	80	40
Fish	1	20	76	64
TOTAL	31	156	4,466	2,520

VII Muzaffarpur Zila School @ Rs 7 per month

Rice	16	56	2,800	1,568
Dal	4	64	620	344
Vegetables	4	6	64	32
TOTAL	24	126	3,484	1,944

VIII Northbrook School Hostel, Darbhanga, @ Rs 7 per month

Rice	20	70	3,500	1,960
Dal	5	80	774	430
Vegetables	6	8	96	48
TOTAL	31	158	4,370	2,438

IX Chapra Zila School Hostel @ Rs 8-8 per month.

Rice	16	56	2,800	1,568
Dal	4	64	620	344
Vegetables	8	12	128	64
TOTAL	28	132	3,548	1,876

X Hazaribagh Zila School Hostel @ Rs 7-8 per month

Rice	16	56	2,800	1,568
Dal	4	64	610	344
Vegetables	8	14	160	80
Mustard oil	1	0	220	238
TOTAL	29	134	3,790	2,230

APPENDIX C

Abstract of the dieteries analysed in Appendix B

No	Name of Hostel	Rate per month Rs	Quantity of food in ozs per head	Nitrogen in grains	Carbon in grains	Calories
I	Sonthal Hostel	7	28	150	3,800	2,158
II	Purulia Zila (Hindu)	7 -	28	122	3,334	1,796
III	Do (Muham)	7 8	26	166	3 326	1,908
IV	Monghyr Zila (Hindu)	10	26½	132	3,948	2,232
V	Do (Muham)	8	25½	132	3,728	2,092
VI	Raghuna*hpore H E School	5 10	31	156	4,466	2,520
VII	Muzaffarpur Zila School	7	24	126	3,484	1 994
VIII	Northbrook School, Darbhanga	7	31	158	4,370	2,438
IX	Chapra Zila	8 8	28	132	3,548	1,876
X	Hazaribagh Zila	7 8	29	134	3,790	2,230
TOTAL		75 2	277	1,410	37,796	21,244
Average		7,8	27 7	1,41 0	3,779 6	2,124 4

A NOTE ON THE EFFECT OF INTRA-
VENOUS INJECTIONS OF ANTIMONY
TARTRATE UPON THE DEVELOP-
MENT OF VACCINIA VIRUS

By

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(Director)

and

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SAMI SABONGY BEY in his article on small-pox in volume III of Byam and Archibald's "Practice of Medicine in the Tropics" has published a series of photographs illustrating the treatment of the disease in the human subject by means of intravenous injections of antimony tartrate. He claims that the results which he has had in non-hæmorrhagic cases are promising, but are as yet too few to enable him to give a definite opinion as to the true value of the treatment. His photographs of a case treated in this way would appear to bear out this contention. It is most important that any method of treatment which promises well in such a serious disease as small-pox should receive the most careful attention. We have thought it of value, therefore, to test the effect of the drug upon the development of vaccinia in calves under strictly experimental conditions.

In carrying out these experiments, we have acted on the assumption that the virus of small-pox and that of cow-pox, if not identical, are, at any rate, so closely related to each other that, if it can be shown that antimony tartrate

exercises an inhibitory effect upon vaccinia, it will, in all probability, produce a like effect in variola.

We have performed two separate experiments similar to each other in all respects—the first upon two, the second upon three, calves, each experimental series being supported by a like number of control calves. The potassium salt was used in the experiments and was made up in a 2 per cent solution.

The weights of the calves were somewhat less than those given for the average human adult (140 to 160 lbs). The dosage of antimony tartrate used was therefore the same as that found suitable for an adult human being. The calves appeared to tolerate these doses quite well. No untoward symptoms were observed. The drug was given intravenously into the jugular vein in each case.

The first table gives the details of the experiments with regard to dosage.

TABLE I
Showing the doses of Antimony Tartrate
Administered to Experimental Calves

Series I

Date	Experimental		Controls		Remarks
	Calf No 94	Calf No 726	Calf No 81	Calf No 100	
Weights	141 lbs	148½ lbs	119 lbs	123 lbs	
19 5 23	1 c.c.	1 c.c.			
21 5 23	2 c.c.s	2 c.c.s			
23 5 23	3 c.c.s	3 c.c.s			
25 5 23	4 c.c.s	4 c.c.s			
27 5 23		5 c.c.s			All calves vaccinated

Series II

Date	Experimental			Controls			Remarks
	Calf No 112	Calf No 113	Calf No 115	Calf No 114	Calf No 117	Calf No 120	
Weights	lbs 115	lbs 137	lbs 109	lbs 138	lbs 146	lbs 124	
4 6 23	1 c c	1 c c	1 c c				
6 6 23	2 c cs	2 c cs	2 c cs				
8 6 23	3 c cs	3 c cs	3 c cs				
10 6 23	4 c cs	4 c cs	4 c cs				All calves vaccinated
12 6 23	5 c cs	5 c cs	5 c cs				

Commencing with 1 c c, the dose was increased by 1 c c on each occasion and was administered on alternate days until a dose of 5 c cs was reached. In order to carry out the test under optimum conditions the calves were not vaccinated until they were well under the influence of the drug and could tolerate maximum doses. The vaccination operation was thus delayed until the day upon which the fourth injection was given, and, in all cases, except calf No 94, a further dose of 5 c cs of the drug was given whilst the vaccine was maturing. All the calves, both control and experimental, were vaccinated in a similar manner in a series of lines, and, as far as each series of calves was concerned, at the same time.

The development of the vaccine vesicles was carefully observed at varying periods with a view to determining any possible differences which might be apparent to the naked eye. When fully developed the result on each calf was photographed and the pulp was removed and weighed. The length of the lines was carefully measured in each case. The period of maturation varied between 98 and 120 hours.

Table II gives the weight of pulp calculated per linear inch sown for the experimental and control calves in each series.

TABLE II
*Showing weights of Vaccine Lymph (pulp)
obtained from Experimental and
Control Calves*
Series I

Calf No		Time or removal of pulp	Weight of pulp per inch sown	
94	Experiment	98 hours	0.41 grms.	043
726	Do	120 do	0.45 do	
81	Control	98 do	0.35 do	055
1000	Do	120 do	0.75 do	

Series II

112	Experiment	100 hours	0.22 grms	035
113	do	100 do	0.02 "	
115	do	100 do	0.63 "	
114	Control	100 do	0.45 "	042
117	do	100 do	0.38 "	
120	do	100 do	0.45 "	

It will be seen at once that the differences between the experimental and control series are too small to permit of any differentiation. It is true that the total weight of pulp removed from the control calves is slightly greater than that taken from the experimental series. This is not universally the case however so far as the individual calves are concerned, for more pulp was removed from the experimental calf No 94 (at 98 hours) than from the corresponding control calf (No 81). No difference in the appearance of the vesicles in the control and experimental series could be detected at any time.

An estimation of the number of bacteria present in the pulp removed from the experimental and control calves was also made. Ten c cms of a 1-100,000 dilution was plated in each case. Table III gives the results. The bacterial count in the case of the experimental calves is

TABLE III

Showing the number of Bacterial Colonies grown from similar quantities of Vaccine derived from the Experimental and Control Calves

	Number of colonies in		
	Series I	Series II	
Experiment	183	97	10 c cms do
Controls	332	48	

somewhat lower in the first series but higher in the second. Here again, however, the differences are not sufficiently large to warrant any deductions being drawn from them.

The results of the experiments appear to show that the intravenous injection of potassium antimony tartrate has no effect upon the development of vaccinia in the calf. It is therefore more than likely that it has little or no effect upon the development of the virus of variola in the human subject. It should be pointed out that the experiments in question were performed during the months of May and June, the least favourable time in Madras for the production of vaccine lymph on the calf. The amount of pulp obtained from each calf was reduced fivefold below that obtainable in the cool season. Under such unfavourable conditions a total inhibition of growth in the experimental calves might legitimately have been expected, had the antimony any inhibitory effect whatsoever. This was not the case however. It can only be concluded, therefore, that antimony tartrate has no effect upon the development of this particular type of virus.

Indian Medical Gazette.

SEPTEMBER

COLONEL KING ON SANITATION IN INDIA

IN a recent article on "Politics and Sanitation" in *Science Progress*, Colonel King, *i r s* (retd), deals with the history of public health organisation in India. He begins by pointing out that the influence of home party politics on the Government of India has made continuity of policy impossible, and that what has been accomplished has been progress of a halting nature.

In 1859 a Royal Commission was appointed to enquire into the sanitary state of the army in India. The need for such an enquiry was evident, as the mortality of the European army was found to be 69 per mille, in Calcutta the death rate varied from 37 to 81 per mille, 23 per cent of the deaths in Calcutta were due to small-pox, and the death rate in jails was from 84 to 120 per mille.

As a result of the enquiry Sanitary Commissions were formed in the chief provinces and the first action of the commissions of Madras and Bengal was to recommend the formation of Public Health Services throughout the Municipal and District Board areas. Had the Government of India been alive to its responsibilities there would have been formed a Public Health Service for the whole of India, but responsibility was thrown on to the Provinces and they pleaded lack of funds. The policy of the Government of India appears to have been to shelve all responsibility and to express the pious hope that with the spread of education the desire for sanitary advance would come from the people themselves. Education of a sort flourished indeed and now University graduates are being turned out at the rate of thousands a year but there is no corresponding growth of public opinion such as was hoped for by the Government of India.

Gradually the Sanitary Commissions became shorn of their prestige and powers and instead of a president who drew the salary of a judge of the High Court, Medical Sanitary Commissioners were appointed in 1869. For a time the Sanitary Commissioners ranked as Deputy Surgeon-Generals, but in 1886 their status was lowered to that of Majors or Lt-Colonels. Gradually the Sanitary Commissioners came to be regarded as subordinate to the Inspector-Generals of Civil Hospitals and the Sanitary Commissioner with the Government of India became subordinate to the Director-General *i r s*, in 1911.

Proposals were made from time to time to establish an All-India Public Health Service notably by Sir Andrew Fraser in 1904 and by the College of Physicians of London

in the following year. Even the Secretary of State for India took up the question in 1907, but to no purpose.

As long ago as 1881 Surgeon Major Cornish made a successful attempt to evolve a Public Health Service for Madras by securing the appointment of a Civil Assistant Surgeon to each district as Sanitary Officer and the Civil Surgeons were termed District Medical and Sanitary Officers. King himself was energetic in the cause of sanitation he secured the erection of an institute for the preparation of vaccine lymph combined with a bacteriological laboratory in Madras and this was followed by the formation of special laboratories at Kasauli, Conoor, Rangoon and Bombay. He also secured the appointment of specially trained Sanitary Inspectors by local bodies and over a thousand of these have been trained. He also persuaded the Government of Madras to appoint special Civil Assistant Surgeons to each district, who should be subject to the orders of the Sanitary Commissioner, but there was opposition to be faced, not only from the Surgeon-General, who claimed disciplinary powers over them, but also from the local bodies who insisted that as they paid these officers they should also control them. The scheme was wrecked and by 1921 only two Sanitary Assistants were employed by the District Boards of Madras.

In 1921 the Ministry of Local Self Government of Madras reported as follows—

"The reluctance of professional men to accept service under Municipal Councils is a menace to the future of sanitation in this Presidency." They found that only four out of sixteen posts sanctioned for health officers were filled and that no candidates for training had appeared for the past three years. In Bombay things are not much better as only 11 out of 157 municipalities have appointed Health Officers. In Bengal—excluding Calcutta—there are 115 municipalities and only 22 have Health Officers. King blames not only the Government, which acted along the line of least resistance by advocating education as the road to sanitation, but also the educated representatives of the local bodies to which self-government has to all intents and purposes been accorded for the past fifty years. He also indicts "certain administrative officers of the Indian Medical Service" whose ill-advised efforts were directed to absorb and dominate preventive medicine.

In spite of all obstacles members of the Indian Civil Service and of the Indian Medical Service have urged the progress of sanitation by every means in their power and it is claimed that—notably in Madras—sanitary administration in India has in several respects effected reforms of method in advance of Great Britain.

King claims that Madras, which gives the largest amounts for medical purposes and the

smallest to education, enjoys the smallest death rate of all the Indian presidencies, 33.4 against 40 to 46 per mille for the Punjab, the United Provinces and Bengal. He points to the fall in the death rate of the British troops from 69 per mille in 1859-63 to 4.36 per mille in the years 1910-14 and of Indian troops from 20 to 4.39 during the same period as evidence of what can be done when sanitary measures are put in force whole-heartedly. Instead of this the Government of India has relied on intensive education for the destruction of the malaria mosquito. King demolishes the excuse of lack of funds by quoting the estimate of an expert mathematician, Stott, who on the data supplied to him shows that malaria costs India over twenty million pounds a year, apart altogether from the suffering and death which it inflicts. It is also estimated that of the amount spent from public funds on education no less than £329,000 a year are wasted owing to the deaths which occur before the age of 29 among the persons educated at public expense. King agrees that education is a most desirable ally of sanitation, but in India it has been pursued "on fantastic lines" which have had inapt relation to the needs of the country, whilst education by practical demonstration of sanitary works for the community has been grossly neglected in the rural areas which contain no less than 93 per cent of the total population. He concludes with the passage "It is early yet to form any forecast as to the progress of sanitation in India under the Montagu Reform Scheme but, so far, it would seem that there is infinitely more anxiety to multiply colleges and universities for academic science and curative medicine of archaic origin, than to remember that the 'first wealth is health' and that 'within human limits health is purchasable by communities'."

Colonel King's article, coming as it does from one whose name will always be honourably associated with the advance of public health in Madras, is of great importance. It should be reprinted and supplied to every one, whether Indian or European, who carries out official or unofficial public work in India. It is not only the consciences of the former Government of India and of the former local bodies that have been asleep, there is far too little evidence of an awakening to the realities of the situation on the part of those who are now responsible for the health of India. The country has not reached the stage of development at which questions of public health can safely be entrusted to local bodies, nor to educated public opinion. In other countries the people for their own good have to submit to measures for the benefit of the public health and have to pay for them. If we follow the principle of "first things first," we must admit that effective organisation of a public health system for India is long overdue.

Facilities for training health officers of the

highest standard of efficiency are now available, notably at the School of Tropical Medicine and Hygiene of Calcutta. The most serious obstacle to reform at present consists in the ever-increasing tendency to relegate responsibility and authority to the Local Governments, these in turn handing over much of their responsibility to the local bodies, with the result that organised and standardised effort for the improvement of public health appears to be as far from realisation as ever.

GREAT ENGINEERING WORKS AND THEIR MEDICAL ASPECTS

RECENT press communications have given a good deal of interesting information about the great Sarda Canal and Sukkur Barrage engineering works, but the statements regarding the medical and public health aspects of these undertakings are disappointingly meagre.

In the first of two recent communiqués dealing with the Sarda Canal the only references to the existence of a medical problem were the following —

"In the short space of two years the engineer's skill and hard work have transformed this unhealthy and malaria-ridden spot into a clean and well laid out camp," and "difficulties in connection with the unhealthiness of the country in the upper reaches of the canal have been considerable and a great deal has been done in antimalarial measures at the suggestion of the Sanitary Board. These measures have tended to reduce malaria and to lengthen the working season. Work in the Terai and forest tracts is even now limited to the months of November to May."

This notice, containing as it does a statement of the existence of a health problem of the gravest importance and only a passing reference to the means of dealing with it, would suggest an entire lack of appreciation of the issues involved, but a few days later there appeared a brief account of the work done by the Malarial Department of the United Provinces which does rather more justice to the medical men concerned. The following extracts from the note are of interest —

"The progress of the works at Banbassa has been very much helped by the antimalarial operations which are being carried on under Major Phillips, the Medical Officer specially deputed by the Medical Department. This campaign has been so successful that work was carried on last year till the rains broke, with a very low incidence of fever. When the work was started in 1920, there was nothing but dense jungle and forest and the climate was so deadly that within a few months of starting work 96 per cent of the labourers were down with fever and work had to be

closed down completely in April that year. Thanks to the antimalarial operations, the working period at Banbassa is expected to extend this year right up to the break of the rains. People who have recently visited the Labour Camp at Banbassa are very much struck at the cleanliness of the Labour Camp and the health of the labourer in a place which is considered one of the most unhealthy spots in the whole Terai area and the engineers there all agree that this is to a great extent due to the energy of the Special Medical Officer and the antimalarial operations undertaken by him. Major Phillips states that as Banbassa is the headworks of the Sarda Canal project and probably the spot where most labour is concentrated, the whole of the Malarial Department confined its activities to that spot during the early months of the year. A laboratory was opened in a small room attached to the Canal Hospital and much useful research work was performed. Strenuous efforts were also made by the Department to improve the sanitation of the area. The result of all these measures was that work on the canal at Banbassa was continued until the end of June, whereas in 1921 it ceased in May and in 1920 in April."

In conclusion Major Phillips states. From the point of view of the results, the work of the Department at Banbassa is unquestionably the most important, and it is gratifying to me that the fruits of our labours here are beneficial to the health of the large community employed in the construction of what is going to be one of the most productive works ever undertaken in the province."

It is evident that much thought has been given to the preservation of the health of the labour forces which are collected in the pestilential headworks area and that a very satisfactory measure of success has attended the efforts of those who are responsible.

A great experiment is being carried out at Banbassa and it is a matter of imperial importance that this should be carried out under conditions which will make for success and that the lessons to be learned from it should be made available to the world. The dangers of collecting large forces in a highly malarial spot are well known there is also the possible risk to the health of the places from which the force is drawn by the return of infected persons to their homes year after year. Then there is the financial aspect of the problem, as it must add enormously to the expenditure when work has to be interrupted for a large part of each year because malaria gets out of hand. A comparison with the Panama Canal inevitably occurs to the reader of the communiqué. The whole world learned a lesson, first from the break down of the French attempt owing to disease and then from the

later American effort which owed its splendid success chiefly to the work of Gorgas.

Presumably some of the distinguished malaria experts such as Christophers or Bentley have been consulted with regard to the antimalarial operations of the Sarda Canal, if so it would be most interesting and instructive to have a report of the recommendations made by them and of the results which have followed from the measures adopted. So far there has been no announcement of the medical arrangements in connection with the great Sukkur Barrage. This also must involve a great health problem which will tax the brains of the best public health experts available in India. Here is an opportunity for making use of the Director of Public Health of India whose post was recently threatened with abolition.

It is in connection with such problems as those involved in the Sukkur Barrage and the Sarda Canal that a Director of Public Health ought to be of the greatest value, provided, of course, that he is given an opportunity of advising on the best methods of dealing with the situation.

THE TUBERCULOSIS PROBLEM IN INDIA

ATTENTION has been concentrated so much on the so-called "tropical diseases" in India that there is a danger of losing sight of the fact that tuberculosis is one of the most urgent problems of this country, and is in reality a most important tropical disease. It has long been known that Gurkhas and other people from isolated places are especially prone to tuberculosis when they come into contact with the conditions of military life.

Recent work has established the fact that most of the people who live in crowded conditions, such as exist in all large cities and towns, contract tuberculosis in early life. As a rule the disease is mild and remains confined to the various glands of the body, unless the resisting powers are low the disease becomes cured spontaneously and a considerable degree of immunity results.

Persons who have been brought up under such conditions are much less liable to active tuberculosis in after life than those who have lived under conditions in which they have escaped infection in early life.

The French in the great war found that their colonial troops suffered very greatly from tuberculosis when brought into contact with European conditions, and much attention is now being paid to the danger of disseminating the disease by persons invalided to their homes. In India the process of invaliding Gurkhas and others to their homes has been going on for many years, but there is very little exact information regarding the spread of infection in previously uninfected

places. The acuteness of the disease among non-immune persons is a striking feature and it is likely that the danger of spread of the infection is much less in the case of persons who die in a few months, than it is in the case of partially immune victims of the disease, who may live to disseminate infection for many years. Thus the very intensity of the infection may lead to its being stamped out rapidly.

The most important recent contribution to the tuberculosis problem in India is a paper by Dr Powell in the *Proceedings of the Royal Society* for 1922. Dr Powell observed the disease closely among the Bombay Police. The young recruits coming in from country were exceptionally free from tuberculosis, the Von Pirquet reaction being positive in only 5½ per cent of 1,532 recruits and physical examination being nearly always negative. The incidence of tuberculosis among these men after residence in Bombay was extraordinarily high and the disease ran a very rapid course, as would be expected among a non-immune community, most of the patients dying within a year of the first appearance of symptoms. Among the important points brought out by Dr Powell are (a) the frequency of the disease without physical signs. Every one will agree that fever is often the only symptom of tuberculosis until the disease has become far advanced, (b) the great rarity of bovine tuberculosis in Bombay. It is suggested that when bovine tuberculosis is absent there are fewer cases of mild immunizing tuberculosis in early life and hence the disease in adults is much more acute. The rarity of bovine tuberculosis in India may therefore not be an un-mixed blessing.

It must be emphasized that the tuberculosis problem in India is not one problem, but many. Each town and village has its own special conditions, and it is likely that a study of the police of Calcutta or of other large cities will show a state of affairs quite different from those existing among the Bombay police. An accurate survey of the distribution of tuberculosis in selected large towns, villages and country areas would add greatly to our knowledge of the problem, which will have to be tackled sooner or later. The great prevalence of intestinal tuberculosis in adults as well as in children in such places as Lucknow calls for explanation. Bovine infection is extremely unlikely and it seems probable that accidental alimentary infection with infected sputum may be the cause. It is also important to find out whether the disease is really increasing in prevalence in India and whether the invaliding of infected persons to their homes in uninfected places is likely to cause the introduction of the disease in these places.

The influence of association with European communities, with modern rapid methods of travel, with varied economic conditions and with

bovine tuberculosis are questions which need fuller investigation. The application of standard European teaching to Indian conditions will not suffice. Tuberculosis in India is an Indian problem which can be solved only by work in this country.

Every medical man is too well aware of the seriousness of the situation, the attitude of fatalistic indifference does not help, a clear knowledge of the true state of affairs and a rational programme for dealing with the situation are urgently needed. Tuberculosis in England and America is a slowly disappearing disease, so far as information goes it is an increasing disease in India, and as yet nothing effective has been done to stay its advance.

A Mirror of Hospital Practice.

THE OCCURRENCE OF *BALANTIDIUM COLI* IN THE FÆCES OF AN INDIAN

By J. A. SINTON, M.D., V.C.,

MAJOR, I.M.S.,

Central Research Institute, Kasauli

Species of the genus *Balantidium* (Claparède and Lachmann), have been recorded as inhabitants of the cæcum and large intestine of man, monkeys and pigs, as well as of many amphibians, and recently da Cunha (1917) has noted its presence in the intestine of the horse.

The species usually found in man, monkeys and pigs is supposed to be the same—namely, *Balantidium coli* (Stein),—and man is believed to derive his infection most commonly through association with pigs.

Castellani and Chalmers (1919) reported the presence of this ciliate in the fæces of a man in Ceylon and it appears to be not uncommon in man in the Far East, but in spite of the large amount of work which has been done on the protozoal fauna of the human intestine in India, no undoubted indigenous case of infection with this protozoon appears to have been yet reported.

The apparent rarity of this ciliate in India may be due to the fact that most of the Indian races regard the pig as an unclean animal and only a few castes keep it as a domestic animal. In the Punjab it is very rarely seen in the domesticated state. It is also possible that this ciliate is not a common inhabitant of the intestine of the Indian pig, as it could not be found in the fæces of three pigs examined from near Kasauli, Punjab. I have also been unable to find it in the stools of six monkeys.

Bentham (1920) recorded its presence in large numbers in association with *Entamoeba histolytica* cysts and *Ankylostoma* eggs in the fæces of an Indian Christian from Bihar who was examined at Malta while on his way back

from France, but as this man had been on foreign service it is impossible to say where he acquired the infection

While examining the faeces of a number of apparently healthy persons in the Central Jail Lahore, Punjab for the presence of *Ankylostoma* eggs, one prisoner was found to have a very heavy infection with this organism

History of the case

The prisoner was a well nourished Pathan about 35 years of age who had been in the jail for about 11 years. His native place was Jhang Punjab and he had never been outside the Punjab or North-West Frontier Provinces of India. He was a Mahomedan by religion and as in Bentham's case had no history of ever having been associated with pigs. During his stay in the jail he had never been under treatment for any intestinal disorder nor did he give any history of either diarrhoea or dysentery.

Examination of the faeces

The stools, which were examined a few minutes after having been passed were well formed and showed a few streaks of mucus and a little pus. A large number of cysts of *Balan-tidium coli* (Stein) were present and a few actively motile forms which were found to be very numerous after the administration of a purgative. The stools were examined on several occasions during the next few weeks and on all occasions showed a very heavy infection with this organism. There were also a number of *Entamoeba histolytica* cysts present which might account for the mucus and pus in the stool.

The organism both in fresh and stained specimens agreed with the descriptions of *Balan-tidium coli* (Stein) as given by Dobell and O'Connor (1921) and other authors.

The cysts measured about 60μ in diameter and the active forms were about 75μ by 50μ .

My thanks are due to Sub-Assistant Surgeon J. D. Baily, I.M.D., for assistance in the collection and examination of specimens.

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Note — Dr G C Ramsay Labac Central Hospital Cachar, in a personal communication states that *Balan-tidium coli* is relatively common in the intestine of pigs and sheep in tea garden coolie lines in Cachar, Assam. *Balan-tidium* (species?) infection, with both motile and encysted forms has also recently been seen in two out of four pigs examined at the Calcutta School of Tropical Medicine — Ed, J M G

FOUR INTERESTING CASES

By W W JEUDWINE, Lt-Col., I.M.S.,
Civil Surgeon, Delhi

THE following four cases were admitted to the Civil Hospital, Delhi, during the last cold weather are uncommon, if not unique.

Whilst admitting that such cases are of considerably more interest to those that deal with them than to the casual readers of reports, I have nevertheless recorded these in the hope that others may relate any other similar cases, as I confess I have never come across them.

Case 1 — Dermoid Cyst in the Abdomen

A girl aged fourteen years came to the hospital suffering from a swelling in the abdomen which had been noticed for the last three years and which had lately begun to give her distress. On examination a round hard smooth tumour could be felt which was freely movable as far as the costal margin on the right side upwards, as far as the right iliac fossa downwards and across the middle line. It appeared to be fixed or attached to the region of the right loin and went back easily into the right kidney region.

There was no pain on movement. It was certainly an intra-abdominal tumour and probably congenital and had almost certainly been present for longer than three years. It was diagnosed as a dermoid cyst on a long pedicle.

Laparotomy was performed (the middle one-third of the right rectus muscle being displaced outwards), and the tumour immediately appeared. It was the size of a foetal head and attached by a long pedicle to the right loin.

Removal was easy, recovery uneventful. The tumour contained a large mass of black hair and liquid purulent material.

Case 2 — Congenital Stenosis of the Urethra

A boy three years old was brought up with the following history — Since birth he had never passed his urine in a stream, but always in drops or a small dribble. Micturition was frequent. For the last two years a swelling had been noticed in the lower part of the abdomen, but although it seemed to decrease in size at times, it never disappeared.

His brother, now seven years old, had had a similar swelling and symptoms and had had an instrument passed with the result that he had passed pus in his urine ever since, but the swelling had disappeared about two years after the passage of the instrument.

On examination a swelling was detected in the lower part of the abdomen in the middle line extending nearly up to the umbilicus, dull on percussion.

During examination the boy passed naturally about two drachms of clear urine. The swelling did not decrease. With much persuasion I was allowed to pass a fine rubber

catheter under an anæsthetic. The catheter passed on easily up to the neck of the bladder, when it was partially arrested. By keeping up the pressure for about half a minute it passed into the bladder and about ten ounces of clear urine were drawn off. The tumour disappeared completely. The urine was acid and had no deposit.

The case, as is unfortunately so common in this country, was lost sight of and never returned for treatment.

It is curious that two boys by the same parents should have had this congenital defect. The elder boy has apparently overcome his defect but has cystitis.

Case 3—A baby seven months old was brought up with a tumour as large as the baby's head, on the left side of the chest. The swelling had been present at birth but had been increasing in size ever since, and during the last month had got rapidly larger.

On examination the tumour was found to be adherent to the chest wall, adherent to the skin, dull on percussion. There was no increase of tension when the child cried and it was not capable of being reduced by pressure. No large vessels seemed to be connected with it. Its consistency was irregular. Hard lumps could be felt in parts, whilst other parts were soft and partially compressible.

Various diagnoses were made, none were correct. It was thought that it might be nœvoid and on that account preliminary cauterisation was suggested before removal by operation.

On the withdrawal of the heated needle after the first puncture, clear deep yellow fluid flowed out in a jet and by exerting slight pressure about eight ounces were evacuated. This was collected and examined. It contained a very large quantity of albumen and within five minutes of being evacuated set in a semi-solid jelly. The tumour was easily removed the next day and found to be a multiloculated cystic tumour which was easily removed from the chest wall. The report of the Assistant Director at the Central Research Institute, Kasauli, on the specimen was as follows—

"The tumour consists of a comparatively dense fibrous network enclosing spaces of various size. Some of these are the size of and resemble in appearance ordinary lymph spaces while others are much larger and have the appearance of definite cysts which are lined with endothelium. Scattered throughout the tumour are small collections of lymphoid cells, some of which are evident in the lymph spaces referred to above. The tumour is covered with normal skin, and contains several sweat glands normal in appearance. It is probably a congenital lymphangioma such as is described by Bland-Sutton under the name lymphatic cyst."
5th June 1923

L. A. P. ANDERSON, CAPT. R.N.S."

Case 4—Stone in the Bladder

This may be of more interest to those at home than in India, where stone is so common,

and is only recorded on account of the size of the stone.

A man aged about sixty years came to hospital and was found to have a stone in the bladder. On examination it was found to be too large to crush with a lithotrite and suprapubic cystotomy was decided on.

On opening the bladder the lotion immediately flowed out and the bladder was found to be filled by an enormous stone. The peritoneum was stripped off the front wall of the bladder up to the top of the fundus, and the viscus opened right up to the top. Even then it was with difficulty that the stone was delivered as it was adherent to the posterior wall and had to be peeled off. Some soft fragments remained attached to the bladder wall. The bladder was sewn up, a drainage tube being left in. The stone weighed 8½ ounces.

These cases are typical of the way in which the Indian seeks competent medical relief and only faces operation as a last resort. It shows how little real progress has been made among the masses in India as regards education when people will suffer or allow their children to suffer, discomfort, and pain for years before giving up "trick" by indigenous medicines.

CANCER OF THE MOUTH TREATED BY EXCISION AND SUBSEQUENT TUBE GRAFTING

By L. W. HEFFERMAN, M.R.C.S., L.R.C.P., (Lond),
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Namtun Surgeon to Namtun General Hospital

The patient was a Chinese girl, aged eleven years.

Previous History—Patient had "fever" for a period of three weeks before admission to the hospital. Six days after this "fever" began she developed an ulcer inside the mouth on the left side which caused her pain. Chinese medicines were applied and after a few days a dark area began to appear. This began to spread and became foul. She had had practically no nourishment except water for the last four days.

13-3-22 Present Condition—The patient is much emaciated. At the left corner of the mouth is a dark area about the size of a shilling. The area around is red, indurated, and very swollen. A foul smelling discharge is present. The other cheek is red and swollen. The child's head and face appear enormous compared to the trunk, which is very emaciated. Temperature 98.2, pulse 120. General condition very bad.

14-3-22 Operation—Under light anæsthesia all the gangrenous area was removed. About five loose teeth were extracted. The condition of the cheek was extremely foul. "Bipp" dressing applied.

16-3-22 Further Progress—Two days later a piece of slough came away from inside the



Fig 1 —Photo of patient taken 17 days after excision of gangrenous area of left cheek Shows tube graft Note emaciated condition of child



Fig 2 —Photo taken 12 days after that shown in fig 1 The tube graft carrying skin from clavicular region has been swung into position, the skin surface towards interior of mouth

right cheek From now onwards the child improved and the gap in the left cheek became much smaller The disfigurement was great and there was actually difficulty in feeding because of loss of substance of the cheek

31-3-22 *Operation* (Fig 1)—Tube graft prepared Two parallel incisions were made over the left sterno-mastoid from the level of the angle of the jaw to the sterno-clavicular joint, skin platysma and subcutaneous tissues were dissected out and the flap thus formed entirely freed except at its proximal and distal



Fig 3—Photo taken three months later The graft has been taken and freed from the remainder of the tube which is now hanging loose Note great improvement in patient's general condition

extremities The edges of the flap were then accurately sutured together thus forming a tube The edges of the wound were undermined and the skin brought into apposition and sutured A piece of Eusol gauze was placed between the tube graft and the neck

10-4-22 *Operation* (Fig 2)—Ether anaesthesia The tube graft was disconnected at the distal end, carrying with it a skin flap removed from the clavicular area The cheek was prepared by freshening the edges and the graft swung into position with the skin surface towards the interior of the mouth This skin would become mucous membrane

12-4-22—The patient's father fed her with solid diet, viz, fried bacon, beef and rice, with the result that the cheek sutures cut through as the result of mastication

13-4-22 *Operation*—The cheek end of the graft was removed from its position and the



Fig 4—Photo of patient taken about a year after her original admission to hospital

whole area properly cleaned The graft was replaced and resutured The patient's lips on the left side were sutured together with silk-worm gut Hot fomentations applied

25-4-22 *Operation*—Some trimming of the cheek end of the graft was done The graft was found to be healthy and very vascular

A long period now followed during which the graft fought for a position against the septic conditions of the mouth. The patient herself became less thin, was able to walk about, do odd jobs and have a normal diet.

15-7-22 Operation (Fig 3)—The tube was separated at its junction with the corner of the mouth. Bleeding was profuse and the end of the cut tube spurted from two or three small arteries thus testifying to the vitality of the tube graft.

29-7-22—The remainder of the tube was removed from the neck. It was not considered feasible to replace the tube graft into its former position in the neck this procedure is, of course, the usual technique.

The patient was discharged from hospital on 9-8-22 after having been in for five months. I have seen her several times in the local bazaar where her father was selling vegetables. Her appearance is improved (see Fig 4).

THREE SIMILAR YET DISSIMILAR CASES OF GYNÆCOLOGICAL INTEREST

Bj W W JEUDWINE Lt.-Col., R.M.S.

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My excuse for publishing these three cases is that they all occurred within a month and form an interesting group in that they were to all intents and purposes similar and yet all were different.

They may be of slight interest to the specialist, but may prove of greater value to the general practitioner and humble Civil Surgeon who may at any time have to tackle an emergency and act on his own initiative.

Case 1—Mrs A married, two children, age about 32 sent for me at 10 p.m. on 31st December, complaining of abdominal pain.

History of Present Condition—Was quite well up to the 29th December when she felt some discomfort in the left side of the lower abdomen and in consequence stayed at home. On the 30th did not feel really well but went about as usual. Bowels were open.

On 31st, felt not so well and stayed in bed, bowels not open. No vomiting, no nausea, had light diet.

Previous History—Had a long confinement with the first child, forceps, no complication. Second confinement natural.

Had always a fair amount of pain at menstrual periods, always worse on the left side. Flow natural—no excess, no clots. Habitually constipated for years, always has to take opening medicine in large quantities. Active habits, walks, rides, plays tennis, dances. Spare frame, always pale.

Immediately preceding her illness had been menstruating from the 26th, and on the 27th

had been out shooting, walking for several miles over rough country. Felt none the worse, flow stopped on the 29th.

Condition on Examination—Patient lying on bed on her back, flat down legs extended, looked pale (habitual) and rather anxious, complained of dull aching pain in the lower left iliac region. Abdomen moved well and easily on respiration, no swelling seen. Slight tenderness on palpation in the region noted. No rigidity.

Per vaginam uterus retroverted, felt larger than normal, but menstruation was just over.

Per rectum body of the uterus felt, moveable, pushed up.

Temperature normal, pulse 80.

An enema was ordered and only water by the mouth till seen again.

January 1st, seen at 9 a.m.—Patient had had a good night, pain practically disappeared. Result of enema had been very successful. Sitting up in bed and feeling very hungry, temperature 98.4, pulse 80.

Patient was to all intents and purposes quite well except for some discomfort in the same place in the abdomen. Ordered to stay in bed, allowed tea and toast and scrambled eggs, ordered soup and milk pudding for lunch.

Seen again at 6 p.m.—Did not feel so well, pain had been rather troublesome, bowels had acted at 10 a.m. naturally, temperature 99, pulse 90, abdominal tenderness still persisted. No rigidity.

An enema was ordered and only water by mouth. Left instructions to be called up at 8 p.m.

At 8 p.m. had been called out to another case and did not return till 10 p.m. Telephoned to ask after the patient and heard that there had been difficulty in giving the enema and that there was apparently some obstruction in the rectum and pain on pressure. Went down at once and examined the patient, temperature 99.4, pulse 100.

Abdomen, the faintest suspicion of rigidity in the left rectus at the lower part.

Per rectum—A swelling the size of a cherry easily felt in the middle line in front, tender on pressure. Diagnosis, either an ovary or the end of an enlarged appendix.

With the syndrome of pain, commencing rigidity, rise of pulse rate and temperature, with a definite swelling tender on pressure felt per rectum, immediate operation was decided on.

The patient was removed to hospital and was operated on at 12 o'clock. By this time rigidity of both recti was well marked. Patient looked very ill. Pulse 120, temperature 99.6.

The abdomen was opened in the middle line below the navel. Free blood-stained fluid welled out. The small intestines were slightly engorged and distended with gas.

The region of the appendix was first examined and the appendix found to be normal. Large intestine empty.

The uterus was found to be sharply retroverted and the body enlarged. This was pulled up, and lying below it was seen the left ovary, lying as it had been felt per rectum, and the left Fallopian tube deeply congested. One small area of the small intestine was also deeply engorged. There were no adhesions.

The coil of intestine soon regained its normal colour. The uterus remained well up. The Fallopian tube was relieved from pressure and the abdomen was closed.

The patient made an uninterrupted recovery and left hospital on the 20th day. Menstruation recommenced the day following operation. The bowels were kept vigorously open. A ring pessary was ordered.

Case 2—On the 10th of June I was called to see a girl (unmarried), 18 years of age and suffering from abdominal pain.

History of Present Condition—Had been ill for two days with abdominal pain and had been vomiting since the previous night.

Had been given an enema with a good result on two occasions in the last twenty-four hours, but the pain had not subsided and she still felt sick. She had just finished her menstrual period.

Previous History—Habitually constipated. Menses always painful, flow scanty.

Had not been really well since the previous October, as she had a daily rise of temperature to 99 or 99.6 in the evening. Had been carefully examined by a very competent doctor who could find no cause for her condition.

Lungs were healthy, no cough. No family history of tuberculosis.

Present Condition—A frail girl lying in bed on her right side with both knees drawn up, looking pale and ill and evidently in pain. Pulse 130, temperature 99.4, respiration 32, complained of severe abdominal pain in the left side, no definite spot, no rigidity, allowed examination but did not like to straighten her legs.

Per vaginum—Not made (virginal).

Per rectum—A large fixed mass felt in the anterior wall, tender on pressure, probably the body of the enlarged uterus or perimetritic inflammation.

Consultation held within half hour of first examination. It was decided to remove her at once to hospital and examine her under anæsthetic and operate if thought advisable.

Under chloroform, nothing felt on palpating the abdomen. Per rectum the mass could not be moved. Chest clear. As the patient was obviously in a critical condition and delay was thought to be dangerous, an exploratory operation was determined on.

The abdomen was opened in the middle line below the navel. All intestines collapsed and healthy. The uterus was enlarged, completely retroverted and fixed. It was only raised with a fair amount of force. It was noticed at the time that the posterior wall of the abdomen appeared to be boggy, especially round the rectum and lower sigmoid, and I remarked that she apparently was still full of accumulated fæces. The abdomen was closed.

The pulse rate dropped to 100 and temperature to 98.6, later to normal.

Seen next morning at 9 a.m. Was comfortable except for the pain in the wound, could lie with her legs straight. No abdominal distension. No nausea, had passed flatus. Temperature 98.4, pulse 100.

At 10-30 a.m. I had a telephone message to say that the patient had had a rigor, temperature 104, pulse 130. Blood taken for malaria. No parasites found. Blood count taken. Leucocytosis present. Patient looked very ill. Wound examined and found healthy, no signs of inflammation, no pus.

Temperature and pulse rate remained high for the next seven days, pain complained of in the rectum.

Per rectum—Swelling felt, very tender on examination.

On the seventh evening after operation the patient passed a large stool which was liquid and contained no fæces but was of dark red grumous material. She continued to pass such matter frequently, having 14 such stools in all with varying quantity. For the next four days her condition improved, the temperature fell to 99-100, pulse 120-130. Put on light semi-solid food.

The stitches were removed on the tenth day and in opening them it was found that the wound had not properly united in the lower part. Some dark green pus welled up from the lower part of the wound. Culture taken, *B. coli* grown. Urine cultured, grew *B. coli*. All stitches were removed and a gridiron strapping applied. The four top stitches had held and union of the surface was complete.

The patient was however, not out of the wood yet.

On the twelfth day after operation and five days after the abscess had burst into the bowel, she developed a severe pain in the left side with a rise of temperature to 104, pulse 136, and respiration 36, cough commenced. The sputum was of the same colour as the mass passed by the bowel and it was evident that the infection had now spread to the left lung. *B. coli* was grown from the sputum. This began to clear up, but six days later she had a second infection higher up in the same lung.

As may be imagined her condition was extremely critical as she could get no rest from

the continuous hacking cough. She was kept alive by frequent injections of camphor in oil, pituitrin, and strychnine. To allow her to sleep she was given heroin 1|25, and later 1|12 grain. That she was pulled through is a marvel and it reflects the greatest credit on her nurses.

One month later she developed a sore over the sacrum which burst and allowed an escape of thick curdy pus. A probe could be passed for one inch laterally. This healed up later on. She also developed a "blind boil" on the outside of the left thigh which subsided later without interference. A vaccine of the B coli grown from her pus was given.

She has made a good recovery. The abdominal wound has healed without further trouble and she can now walk about (April). She has gained 33 lbs. in weight.

Case 3—Mrs H., married, 32, no children, a healthy active woman sent for me on the 30th January at 9 a.m., suffering from severe abdominal pain.

History of Present Condition—Was suddenly taken ill with pain in the abdomen at 3 a.m. The pain was in the lower right iliac region, extending up the flank.

She had been in perfect health up to that time, and on the previous day she had ridden about 10 miles on a horse which had a very heavy action and had been rather shaken. She was menstruating at the time.

Previous History—Nothing important. Always took opening medicine.

Present Condition—Patient when seen at 9 a.m., six hours after the onset of the pain, was in a state of partial collapse. She was vomiting frequently but the vomit was only the stomach contents and any water she drank. For the rest it was retching rather than vomiting. She was pale and her eyes looked sunken. Temperature 97, pulse 80.

The abdomen was rigid, both recti being well defined the right one more than the left. Nothing could be made out by palpation over the abdomen, owing to the state of the abdominal wall.

Per vaginam—The os uteri was pointing forwards. The uterus could not be felt on bimanual examination.

Per rectum—There was a swelling on the anterior rectal wall which was evidently the body of a retroverted uterus. It was firmly fixed and could only be moved by a fair amount of force and then did not come up completely.

I ordered an enema to be given and returned a short time later with a ring pessary. The uterus was pushed into place with the patient in the knee elbow position and the ring pessary inserted.

The vomiting ceased and the pain was relieved. She made an uneventful recovery and the pessary was removed a week later.

There are several points of interest in these three cases.

They were all cases of constipated women with a condition of retroverted uterus, and though all had physical signs of an acute abdomen, they were all different.

The difficulty in the first case was to arrive at a definite diagnosis. The patient looked and felt well on the morning after my first visit and had been much relieved by the enema and had had a natural stool that morning, yet the discomfort persisted in the same place. This might have been due only to flatus but the fact that it remained made me call in again the same evening. There was then a slight rise of temperature and pulse rate as well as pain, and things looked more serious.

It is easy to be wise after the event, but it is quite likely that had a ring pessary been introduced at the time, the patient might have been saved from developing the intestinal obstruction and pressure on the Fallopian tube.

She evidently developed prolapse of the left ovary with strangulation of the tube and partly of the bowel. Another point of interest is the rapidity with which the symptoms developed. I think it is probable that the small intestine was partially linked with the Fallopian tube earlier on, but there were no symptoms to point to it.

The second case, coming as it did so soon after the first, may possibly have influenced one's judgment. The point at issue however was, was one to operate or not? There was no *via media*.

The points for operation were—(1) The patient's general condition. (2) The duration of the symptoms with no relief. (3) The presence of a fixed mass felt per rectum on the anterior rectal wall. What the condition was could not be determined.

The points for "wait and see" were—(1) There was no rigidity. (2) The diagnosis was not clear. (3) The mass felt per rectum might not be causing obstruction, and no real immediate danger threatened.

On the other hand to wait for rigidity to occur was like waiting for a post-mortem, and an abdominal section would at all events settle the diagnosis, might effect a cure, and would probably not do much harm.

As it turned out the case was one of subphrenic or retroperitoneal abscess and was probably rendered acute by the pulling up of the uterus which disturbed the inflamed tissues in its neighbourhood. The infection was almost certainly a pure B coli one and she had a blood infection as well as the local one.

The third case was one of acute retroversion of the uterus with probably some strangulation of the right Fallopian tube. In Herman's "Diseases of Women," 1913, page 148, "exceptional case of sudden retroflexion," he states that "these cases are infrequent. The

symptoms complained of are sudden pain referred to the sacrum and the patient may feel faint and giddy and perhaps sick" This case presented other aspects The patient was sick There was no sacral pain and the abdomen was very rigid Pain was in the right side but not in the region of the appendix The one saving grace was the quality and rate of her pulse I suppose in the whole range of surgery there is no more exacting case than "the acute abdomen" To have three in a month in this class of practice is rare I can only thankfully say, in the words of the children's fairy tale books, that they all lived happily ever after

Current Topics.

The World Incidence of Leprosy in relation to Meteorological Conditions

By SIR LEONARD ROGERS

*Trans Royal Soc Trop Med Hygiene, 15th Feb, 1923
Vol XVI, No 8, p 440*

THIS most interesting address is an extension and amplification of Sir L. Rogers' paper in 1922 before the Tropical Diseases Section of the Royal Society of Medicine, of which a precis appeared in the *I M G*, for November 1922, p 427 Areas and countries with high leprosy incidence shew certain very definite correlations First with hot and humid conditions thus on a study of a map of the world incidence of leprosy the author shews that all countries with leprosy incidence rates of from 5 to 200 per mille are situated in those tropical regions with the highest rainfall rates Of tropical areas with a leprosy incidence of from 1 to 5 per mille almost all fall into the areas of high rainfall and within or close to the 80 degrees F isotherm Here even the exceptions prove of the rule thus in Brazil the general incidence is 0.72 per mille, but the provinces of Matto Grosso, Ceara, Piahy and Bahia, which are areas of comparatively low rainfall in the midst of areas with very high rainfall, shew very low leprosy incidence In the very dry tropical areas with less than ten inches of rain a year, Peru, W. Bolivia, N. Chile, and the former German S. W. Africa are the only important areas reported free from leprosy and are also the only ones with very hot dry climates In the temperate zones Iceland, the north of Korea and Japan and—formerly, but not now,—Norway shew leprosy incidence rates of 1 to 2 per mille,—these again being areas with high rainfall incidence In the sub-tropics S. China, with an incidence rate of 1 per mille and Japan, 1.94 per mille, are again countries with high rainfall and high leprosy incidence parallel

Turning to India the author gives detailed maps shewing leprosy incidence and rainfall,—maps which will be of great value to workers on the leprosy problem in India Where the leprosy incidence is very low, 0.06 to 0.15 per mille, the rainfall is less than 30 inches per annum The areas with an incidence of from 0.15 to 0.5 per mille have a rainfall of from 30 to 50 inches The areas with a high rainfall shew in general a high leprosy incidence, such as Bustar State, 0.87, Assam, 0.65, S. C. Burma, 0.90 and others On the other hand some areas with high rainfall, such as Lower Bengal, shew low leprosy incidence—apparently because of the scantiness of communications and the relative segregation of families in widely separated houses

Of conditions favouring the spread of leprosy a low stage of civilisation, defective and overcrowded houses, general and especially sexual promiscuity, absence of all fear of the disease, and diets defective in vitamins appear to be important The greater infectivity of the tubercular type of case, and the special susceptibility of children and adolescents under the age of 20,—(where the author quotes one half of 4,000 analysed cases as having occurred below the age of 20 years, and two-thirds before the age of 35 years),—must be remembered

Taking all these epidemiological facts into consideration, how is infection with leprosy acquired? Almost certainly by direct inoculation, as to which point almost if not all modern authorities are now agreed The role of insects however deserves consideration Of fleas, bed bugs and mosquitoes fed upon leprosy nodules and subsequently examined from 1 to 10 per cent, shew bacilli in their gut—if we except an extraordinary finding by Noc of 50 per cent of 150 fed mosquitoes found infected As now shewn by several workers the skins of perfectly healthy persons living in association with lepers frequently shew acid-fast bacilli, and the most striking incidence of this is the group of seven cases recorded by Anche and Leboeuf,—persons in contact with lepers who shewed acid-fast bacilli on apparently healthy skins and of whom two subsequently developed leprosy and one died from the disease

If inoculation be the usual mode of transmission of the virus then the importance of hot and humid climates in the spread of leprosy is probably associated, not with any special biting and transmitting insects, but with the special tendency of persons living in such areas to be covered with insect bites, scratches, and lesions offering an entrance to the bacillus Even in Iceland and Norway mosquitoes are very prevalent at certain seasons of the year

The enormous statistical basis upon which this paper rests and the maps which accompany it render Sir L. Rogers' latest paper upon the leprosy transmission problem one of the most important contributions to the literature of the disease

Intensive Rural Sanitation at Gaya

AN experiment which is at present in progress at Gaya is one which may arouse considerable interest in medical circles in India Gaya has always been notorious for its cholera prevalence, and two years ago the Gaya District Board decided to institute "intensive rural sanitation" It was considered that there should be at least one dispensary to every 100 square miles of area in the district as the district contains 4,714 square miles, of which about 300 can be counted as either municipal towns already provided with dispensaries or as very sparsely inhabited, this meant that 44 dispensaries would be required The actual number already in existence was 18, so that 26 more were necessary, of which sanction for the opening of 7 was obtained in 1922-23 It is proposed to amalgamate the existing sanitary staff with the scheme, and at each dispensary to place—

(a) In charge a doctor on Rs 100 to 150 with free quarters, and a fixed conveyance allowance of Rs 20 p.m.—private practice being prohibited

(b) One compounder at Rs 30 to Rs 45, plus Rs 15 fixed conveyance allowance

(c) Seven coolies at Rs 8 to 10 p.m.

The doctor's duties are to be as follows—(a) In the mornings attendance at the dispensary and seeing the sick, (b) In the afternoon to tour his own area of some five miles in radius according to fixed plan inspecting wells, water supplies, drainage etc. giving lantern lectures on matters of public health and sanitation visiting the *hâts* on fair days and—in the event of any epidemic occurring—immediately proceeding to the spot concerned in order to take the measures necessary also the control of vaccination in the area concerned The entire scheme is to be

supervised by an officer of the Assistant Surgeon class with a diploma in either Public Health or Tropical Medicine and Hygiene, assisted by another Assistant Surgeon with or without such diploma. Financially during 1923-24 the cost of a partial inception of the scheme is estimated at Rs 2,61,184, including Rs 73,866 on miscellaneous grants for vaccination contributions to existing institutions, etc., which do not come directly under the proposed scheme. An additional statement appended shews that whereas general medical and sanitary measures in the district now cost Rs 3,23,488 under the proposed changes the total annual cost would only be Rs 2,98,024—the chief item in saving being Rs 28,200 for 47 distributed doctors to the new dispensaries as against Rs 50,710 for 47 doctors under present arrangements. In addition to rendering medical aid at the dispensaries the new doctors will also be required to give medical aid in the villages visited and to see patients at their homes in the villages when they go to the villages.

The results of the Gaya experiment may be of some interest but it seems a little doubtful to what extent a good class of doctor can be secured for Rs 100—150, with no private practice allowed. In that it combines medical practice with a study of the local sanitary conditions and the best measures needed for their betterment the proposed scheme is excellent. At present there is undoubtedly in India too little contact between medical and sanitary departments but we feel that the weak point of the scheme is the proposed remuneration of the men whom it is proposed to engage.

The Chemistry of Pituitrin

DR H N DASS M.A. M.D. Professor of Biochemistry University College of Science, Calcutta, brings forward evidence to shew that chemically pituitrin is entirely different from adrenalin. Pituitrin is the hormone obtained from the pituitary gland, which according to the prevailing view is a secreting gland. An extract of the posterior lobe of the gland causes a rise of blood pressure and increases the flow of urine.

On the other hand there are physiologists who regard these effects as corresponding with those of adrenal extract. Pituitrin gives the adrenalin reaction. The studies of Porak shew that the pressor action is dependent upon the secondary reaction induced through the liberation of epinephrin from the adrenals. Sajous, in fact believes that "the pituitary body contains the governing centre of the parathyroid apparatus and adrenals and co-ordinates the secretory activity of these organs." Basing his argument upon the structure of the posterior lobe which consists of neuroglia, pigment and occasional nerve cells Swale Vincent remarks "it is extremely difficult to imagine how such a structure can be regarded as a secreting gland." Again Kohn points out that "there is nothing to suggest that the posterior lobe has an internal secretion." The presence of chromaffin cells in the organ suggests that there is no special secretion of the gland. Watanabe and Crawford (1916) are of opinion that the active pressor principle of the posterior lobe is adrenin, though the facts upon which they base their opinion are not convincing.

Intravenous injection of pituitrin as with adrenalin, is followed by a rise of arterial blood pressure with this difference that—

- (1) The rise is very sudden in the case of adrenalin
- (2) But more prolonged and lasting in the case of pituitrin

(3) A second injection quickly following the first is ineffective in the case of pituitrin, whilst adrenalin produces a rise with each injection.

It may be that we have here an example of such drugs as the bromides or the digitalis group, having similar physiological actions, but differing in their chemical nature.

To verify this, the author compared the reactions of these two glandular products with different chemical reagents. For this purpose he used three different kinds of extracts which have always given satisfactory results—

(a) Saline extracts of fresh glands from sheep and goats

(b) One per cent extract of dried gland substance collected from sheep and goats

Made by macerating the finely ground tissues for four hours with a strongly diluted solution of acetic acid with the temperature just below boiling point of water. This when filtered gave a clear solution.

(c) Stock solutions from Messrs Parke, Davis & Co

In each case the blood pressure was tested and found to increase when an intravenous injection was given. Finally these extracts were submitted separately to the following chemical tests—

(1) With heat adrenalin solution becomes slightly pink coloured but pituitrin undergoes no change.

After heating pituitrin retains its property of raising blood pressure. Hence it is not merely a tissue extract which contains histamine, nor an enzyme, but a hormone obtained from the posterior lobe of the gland. Again histamine is not pituitrin as noted by Guggenheim, as there is a difference in the stability of posterior lobe extract and of histamine towards alkalis. This was confirmed by Dudley. It has been suggested that it may be a decomposition product before extraction, as it is not always present in fresh extracts.

(2) On heating with caustic soda adrenalin gives a brownish froth pituitrin nothing.

(3) With cold sulphuric acid adrenalin becomes yellow in colour but no change with pituitrin.

(4) With hot sulphuric acid adrenalin is quickly charred, pituitrin changes to a yellow colour.

(5) With nitric acid adrenalin changes to yellow brown colouration with slight effervescence, whilst there is no change in pituitrin.

(6) With ferric chloride adrenalin gives a transient green colour but there is no change with pituitrin.

(7) With Fehling's solution slight reduction in the case of adrenalin, with negative results in the case of pituitrin.

(8) With picric acid solution adrenalin does not change but with pituitrin a slight white coloured precipitate occurs, owing probably to the presence of adherent proteoses and albumoses.

(9) With Folin's reagent (containing sodium tungstate and phosphoric acid in definite proportions) adrenalin gives an intense blue colour but pituitrin remains negative.

(10) With a solution made with 1 c.c. of dilute hydrochloric acid (25 c.c. N/10 HCl per 100 c.c.) and 1 c.c. of 0.2 per cent sodium iodate solution, when adrenalin solution was added and heated just to boiling point a beautiful purple colour was obtained, when pituitrin solution was treated under similar circumstances it remained unchanged.

These reactions shew that chemically pituitrin behaves differently from adrenalin.

CONCLUSION

Pituitrin may resemble adrenalin in its physiological action so far as rise of blood pressure is concerned but chemically it is quite a different substance. (Abstract from original communication)

REFERENCES

- 1 Sajous "Internal Secretion and Principles of Medicine"
- 2 Swale Vincent. "Internal Secretion and the Ductless Glands"
- 3 Martindale and Wescott "The Extra Pharmacopeia (1915)"
- 4 L. Barker "Endocrinology and Metabolism (1922)"

At once we see the enormous range of possible applications of these discoveries, and d'Herelle's next set of experiments, here recorded on pp 173-271, open up an entirely new and possibly immensely important field of therapy. In bacillary dysentery and the enteric fevers a daily study of the stools shews that the number of stools daily and the virulence of the bacteriophage strains isolated daily are inversely proportional. In epidemic dysentery the immunes shew a bacteriophage of high virulence, in the diarrhoeas associated with such epidemics we have what would be true dysentery did not the bacteriophage in such persons step in and conquer the infection. In avian typhosis immune chickens shew a bacteriophage of high virulence towards the bacteria concerned, convalescents similar findings, fatal cases a bacteriophage of little virulence or a complete absence of the bacteriophage. Immunisation against avian typhosis by injection of bacteriophage cultures proved experimentally to have the most amazing results: sick fowls recovered the epidemics stopped the moment all remaining fowls were inoculated. In *barbone* or hæmorrhagic septicæmia of the buffalo, the bacillus is found in contaminated soil, but so also is the bacteriophage, and a highly virulent strain can be isolated from the fæces of convalescent animals.

The immunising culture used either by injection or injection, contains the bacteriophagous ultramicrobes together with the soluble substances derived from the destroyed bacterial bodies and the author concludes with a series of experiments on man. Here the results are of great interest. On ingestion or injection in large amounts there is absolutely no toxic reaction: a statement which cannot be made for a Shiga bacillus vaccine, whether detoxicated or not. Ingestion of 2 c c of bacteriophage culture in cases of Shiga dysentery during an outbreak near Paris was followed by the most remarkable results: the dysentery ceased the stools became reduced to one or two per 24 hours they were often formed within three days. Seven cases are quoted all with extraordinarily successful results, although the author is careful to make no exaggerated claim upon so small a basis of observations.

Do we here stand upon the threshold of something entirely new in medicine and in immune therapy? We can use antiseptics which will destroy bacteria; we can use immune sera which may confer a temporary and passive immunity; we may employ bacterial vaccines to which the patient may react by an immunity response. But suppose that we may soon be in a position to inject an emulsion of the living bacteriophage, a product which given suitable circumstances of environment and growth will multiply rapidly and in so doing live upon and destroy the disease-producing bacteria: such an advance in therapy would revolutionise our whole methods of treatment of bacterial diseases and our conceptions of immunity.

It remains only to add that d'Herelle's work is being carried out at the Pasteur Institute of Paris, and is therefore fully authenticated and to refer readers to a careful and repeated study of a book which may in the near future become a classic in medicine.

TRANSLATION OF SELECTED PASSAGES —
From Laennec's "De l'Auscultation
Médiate." With a biography by Sir W. Hale-
White, K.B.E., M.D., 1923. 193 pp. 10 illus-
trations. John Bale, Sons and Danielsson,
London. 12/6 net.

This volume is one of the Medical Classics Series, — a series already distinguished by Sir Rickman Godlee's *Life of Lister* and by Dr Comrie's *Life of Sydenham*. To say that it equals in interest both these two books is to accord to it high praise. Laennec, 1781-1826 is one of the most pathetic yet interesting figures of medical history. A life-long sufferer from phthisis, from which he died at the early age of 45, his early career was clouded with dire poverty and harassed by a father

who ever stinted him of funds, and who, when he became famous, became a hanger-on for place and position. Fortunately the young genius was taken up by his uncle, Guillaume François Laennec, rector of the University of Nantes, and a man of singular charm and high influence.

Entering the Hotel Dieu at Nantes as a medical student at the age of 14, Laennec moved on to Paris in 1801 and from that moment his career never faltered. Suffering incessantly from asthma, angina, insomnia, neurasthenia and later from declared phthisis, he was incessantly hampered by poverty and a country Bretonais plunged into the turmoil of Nantes and Paris of the Revolution and the Empire, Laennec yet worked incessantly and steadily. Disregarding the theoretical teaching at the Salpêtrière, and turning to La Charité, where the medical teaching under Corvisart was based upon morbid anatomy, he came successively, under the influence of Dupuytren, Bichat and Bayle. It was this teaching which taught him the secret of his future work: that clinical examination must be based upon morbid anatomy, that the post-mortem room was where the physician learnt his mistakes and also how to rectify them.

In 1803 he began to lecture on morbid anatomy, and was awarded the Grands Prix in both surgery and medicine. In 1804 he published his thesis for his diploma, "on the Hippocratic teaching with reference to practical medicine." His father having refused to find the funds for its publication, the money was found by his uncle. In 1805 he set up in practice in Paris and by 1807 his reputation as a Paris physician was made and he became at last free from monetary worries. In 1814 his love of his native country, Brittany, led him to collect in the wards under him at the Salpêtrière the Breton wounded from Napoleon's campaigns and Sir William Hale-White dwells upon the heroic struggle which Laennec and his staff had against typhus among the doctors and nurses and staff there were 214 deaths from the disease.

In 1816 he was examining a young woman presenting symptoms of cardiac disease. The patient was very stout and but little could be elicited by palpation and percussion. Laennec took a sheaf of paper, rolled it into a tight roll, and placing one end over the præcordial region applied his ear to the other end. He records the amazement with which he discovered that he could hear the heart sounds far more clearly than by direct application of the ear to the chest. Thus began the beginnings of the stethoscope. In 1818 he was lecturing to the Faculty of Medicine on auscultation and a few months later he described ægophony and pectiloquy. In 1819 the first edition of "De l'Auscultation Médiate" was published: the price of the book was 13 francs and that of the wooden stethoscope sold with it 3 francs.

Laennec had made many previous contributions to medical literature, chiefly from the standpoint of morbid anatomy, but the publication of his most famous book immediately created a revolution in medical science. He taught that medicine, like other sciences, rests on observation and experiment. "In this astonishing book," writes Sir W. Hale-White, "there occur perfect, precise and original descriptions of clinical symptoms and post-mortem appearances, neither too long nor too short, for the most part as true now as on the day they were written. Many of them refer to conditions till then unknown or at least not properly appreciated, such as pulmonary tuberculosis, pneumonia, pulmonary œdema, etc." Three factors combine to make this famous work of Laennec's one of the greatest classics in medicine: the fact that the whole of his observations rested on the clinical-morbid anatomy method of studying disease, which still to-day and especially in the English schools remains the corner stone of medicine; secondly his clear, lucid and vivid account of the sounds heard with the stethoscope—in which connection the reader of this translation will find throughout clinical accounts which leave

even the text books of to day behind and thirdly his clear cut accurate, and literary style. At a step this frail, emaciated figure, living upon his nerves rather than upon any inherent vitality, yet endowed with a penetrating and illuminating genius, became one of the most famous of the physicians of the century.

In 1819 he was compelled on account of his health to leave Paris for his beloved Brittany, where he preached and practised the open air treatment of the disease from which he suffered. The poor loved him, wealthy patients he would not infrequently turn away, yet his skill and his interest were ever at the disposal of his Breton friends. To the local practitioners he introduced his stethoscope and taught them its use often example would prove better than precept, as in the case of a patient sent to him as being moribund from phthisis with supposed cavitation of the lungs — a case which Laennec shewed to be one of empyema.

In 1821 he returned to Paris in somewhat better health, and was given several appointments amongst others the clinic at the Charité. Here there gathered around him classes drawn from the most earnest medical men and students in Europe. In 1822 he was elected Royal Lecturer at the College of France "on three days a week a carriage would drive into the court of the College a little wasted man wearing a wide-brimmed hat and wrapped in a large cloak would get out and straightway begin his lecture to an audience of about forty, all of whom came voluntarily. The discourse begins quietly but gradually salutes, criticisms and trenchant criticisms of current doctrines find their way into it. The lecturer's tone becomes more ironical his eyes sparkle behind his tortoiseshell spectacles, a general smile spreads over his audience and the sermon comes to an end. Notes in his own handwriting for nearly all the lectures still exist, and from them we learn that they covered the whole of medicine." So strongly did he believe in fresh air and the sea as curative of phthisis that he insisted on his patients having their windows open day and night and often seaweed was spread around their beds.

In 1822 he was appointed physician to the Duchess of Berry and honours and court duties fell to him. In 1824 he married Madame Argou, a staunch friend of many years and the next three years saw him established in Paris as a general consultant and court physician but with ever failing health. In 1826 he took his last journey to Brittany, and died at his country manor of Kerlouarnet on August the 13th of that year.

Sir William Hale White's biography is a well told story of a great and noble spirit struggling against poverty, ill health and a thousand obstacles to seek its fulfilment. In the selected and translated passages which follow the reader will find a wealth of accurate, painstaking, and illuminating writing which scarcely any text book of to-day can place before him more clearly or more forcibly. The publishers of this little volume are to be congratulated on a most welcome addition to an already excellent series.

ANNUAL REPORT.

FIFTY-FOURTH ANNUAL REPORT OF THE
DIRECTOR OF PUBLIC HEALTH FOR
BENGAL, 1921

By DR CHARLES A BENTLEY, M.B. D.P.H.,
D.M. & H.F.S.S.

DR BENTLEY'S annual reports are always interesting reading. His presentation of statistical facts and his observations and deductions from them are never

stereotyped, but have a novelty and often an unexpectedness which command the attention not only of sanitarians but also of economists and the general public. Comparisons of death rates and birth rates and disease incidence are in themselves extremely interesting, but the modern sanitarian has to look beyond these for discoveries of cause and effect and for means of advance. In short, economic factors are fundamental in determining progress and decadence, and microbes and men are alike the playthings of these factors. In the report under review Dr Bentley analyses the vital occurrences in Bengal from this point of view and shows the effects of rainfall, harvest and prices on birth and death rates. 1921 was a census year and gave an opportunity of "taking stock," so to speak, and of correcting impressions and views based on previous census figures. The population of Bengal in 1921 was 46,522,293, representing an increase of 2 per cent over that of 1911. But this increase is by no means evenly distributed. Burdwan Division, for instance, has actually decreased by 4.9 per cent, the Presidency Division is stationary, whilst Rajshahi, Dacca and Chittagong divisions show increases of 26.6 and 11.9 per cent, respectively. The total natural increase of the population of Bengal during the decade 1911-21 was only about one-third of the increase in the previous decade 1901-11, the reason for this was the great influenza epidemic which was responsible for 750,000 deaths and probably diminished the births by 500,000.

As regards vital occurrences generally, the incompleteness of registration is a matter of great concern. It is of course obvious that correct returns of vital occurrences are the means by which the healthiness or otherwise of a district can be gauged and the progress of public health betterment is impeded by the carelessness and indifference of local authorities in regard to the registration of births and deaths. In the rural towns of Bengal registration under the Births and Deaths Act is now largely a dead letter and the recording of both births and deaths appears to be getting progressively worse instead of better.

The birth rate and death rate for 1921 calculated on the new population are 28 and 30 per mille respectively, so that the 'natural increase' is minus 2 per mille.

Taking the 'natural increase' as evidence of the healthiness of a country, Bengal stands seventh of the ten provinces of India, the Punjab heading the list and the Central Provinces being lowest.

Dr Bentley's detailed considerations of the birth and death rates demand attention. In the first place the above figures of 28 and 30 probably do not represent the actual facts. Special investigations were carried out in selected circles for five years and from these it would appear that the normal birth rate for Bengal is about 46 to 47 per mille, varying from 24.1 to 62.9 per mille, whilst the death rate may be put at about 40, varying from 35 to 50 per mille in healthy and unhealthy years.

But whilst this is so, the errors of omissions probably remain more or less constant for any particular area, so that large differences can be accepted as really indicating varying degrees of healthiness.

The birth rate of a province or district reflects conditions as they were nine months previously and may therefore be taken as an index of the vitality of a population during the preceding year.

Death rates on the other hand indicate more or less faithfully the conditions existing at the time when they occur. The population of Bengal is largely an agricultural one and it would be expected that the harvest yield would have an important bearing on the birth rate. "But the prosperity of an agricultural population is governed by two main factors, the yield of the harvest and the market prices realised. Although

the harvest of 1920 was comparatively favourable, there was so great a relative fall in the prices of agricultural produce generally including rice, jute and oil seeds, that the agricultural population were in a worse condition monetarily than they were during the preceding twelve months. Hence, although the easing of conditions as regards food-supply resulting from a relatively good harvest was followed by a reduced mortality, the surplus wealth ordinarily accruing to the agricultural population, which in existing circumstances is spent almost exclusively in the maintenance of large and frequent families, was less than usual, and the conception rate and subsequent birth rate declined materially in consequence."

This raises an argument which we cannot follow fully here but one which those interested in the advance of the province must take note of and consider. The excess of births over deaths in the various districts and divisions of the province is fully discussed and especially the prices of food-grains and their effect on births. We give these observations in Dr Bentley's own words

*"Excess of Deaths over Births—*For the fourth year in succession the deaths in the province have exceeded the births, in 1918 by 16 per cent, in 1919 by 32 per cent, in 1920 by 9 per cent and in the present year by 78 per cent. It will be seen that the deaths exceeded the births in every Division except Chittagong. This is the first year on record in which the death rate of the Dacca Division has exceeded the birth rate. There is little question but that the low prices realised by the cultivators of this Division for their jute crops during the past two years has had the effect both of increasing deaths and diminishing births, but it is to be feared that as a whole the health of this Division is already upon the down grade. There are grounds for believing that the heedless multiplication of embankments in the Mymensingh and Dacca districts in recent years for the purpose of communications has already begun to show its effect upon the health of these areas, and if this process continues we may expect to see the sequence of events that has brought about the decadence of the Burdwan and Presidency divisions repeated in the Dacca Division also, with results disastrous alike to the health of the affected locality, the well-being of the province as a whole and the prosperity of both the city and port of Calcutta

*"The Prices of Food-grains and their Effect on Health—*During the year under review the prices of food-grains were lower than in the preceding year, the amount of common rice purchasable for one rupee being on the average 30 per cent more than in 1920. An error crept into last year's report regarding the seasonal course of prices and their effect on health—the figures relating to the amount of rice purchasable for a rupee were accidentally confused with those regarding the price of common rice per maund, it being stated in consequence that 'food-grains were cheapest in the period June to September' and 'there was a tendency for prices to increase towards the close of the year' exactly the opposite to what really happened. In preparing for this year's report last year's error was discovered, and when graphs had been prepared it became apparent that in Bengal there is a very marked correlation between prices and mortality, but contrary to what is generally believed this correlation is a negative and not a positive one. Thus high prices of food-grains are associated with low death rates and low prices with a high death rate, and when changes occur a rise in prices is followed by a fall in mortality and a fall in price by a corresponding rise in the death rate. The difficulty formerly experienced in tracing a connection between prices and mortality is now explained. This is a discovery of the very greatest importance. Moreover, the graphs of prices and mortality for each district show that the seasonal course of prices is in all probability the main factor determining the peculiar seasonal mortality curve observable in Bengal which differs markedly from that of the other provinces. The present results were not entirely unexpected. It was stated for example in the

Sanitary Report for 1917 that 'the low prices of grain jute and other agricultural produce will undoubtedly affect a considerable proportion of the cultivating classes adversely' and in the report for 1919 it was pointed out that 'increased prices of food-grains, while bearing heavily on certain classes of the community, tend, in the presence of reasonably good harvests, to benefit greatly a large proportion of the population'. The truth of these conclusions has now been clearly demonstrated and is exemplified in the current year. The price of common rice, which in 1920 had risen to its highest point in the early part of September, fell rapidly during the last quarter, and in the first half of January 1921 was 38 per cent lower than it had been three months previously. This fall in prices was accompanied by a general increase of mortality throughout the province. During the second half of January there was a slight rise in prices continuing to February and as the prices rose mortality fell. Prices fell rather suddenly in March and there was a corresponding sharp rise in mortality. During April prices rose and continued to harden to the end of July when they were 15 per cent higher than in March and while this was happening mortality diminished rapidly and continuously. In August there was a 3 per cent fall in the price of rice and a corresponding rise in mortality, during September prices hardened slightly and mortality remained stationary, towards the end of September prices began to fall rapidly until at the end of November they were 25 per cent lower than they had been throughout the summer, and while this was occurring there was a steady increase of mortality. In December prices rose slightly and this rise was immediately followed by a fall in mortality. This correlation between the prices of common rice and mortality is to be observed whether we examine the figures for divisions or individual districts. The effect on mortality of a rise or fall in the prices of jute and other agricultural produce can also be traced in the case of areas where such crops are of importance. This was specially noticeable in the case of the Dacca and Rajshahi divisions, a rapid fall in the price of jute being accompanied by a rise of mortality until a slight hardening of prices occurred in December accompanied by a corresponding fall in mortality. In view of the facts stated it is clear that in Bengal measures aimed at restricting the prices of agricultural production may be fraught with the very gravest consequences to the health and welfare of the population whose prosperity is almost wholly dependent upon two factors—the general character of the harvest and monetary return obtained from the sale of the crops."

The view is novel, and at first sight may seem paradoxical.

The point arises whether the 'decadent' parts of the provinces have not reached their maximum producing point. This point may have been brought nearer by an alteration in the productive power of the land, by lessened rainfall or interference with its natural water-supply. There is heightened liability to disease which is enhanced by the very conditions reducing the productivity of the land and so the vicious circle proceeds. But "to attack resulting disease only will not remove the causative condition" to stem the tide of decadence and disease, the primary economic factors must be studied. The sanitarian, the agricultural expert and the engineer must all combine in their work—either alone cannot achieve the object. Once the productive power of a country is perfected and the population number has reached that stage when it is beginning to require more energy for its maintenance than the productivity of the country gives, then Nature will step in and adjust matters despite the sanitarian, the politician and all others. The problem of living is to keep the potential energy output of the country ahead of the energy required for the maintenance of the population number."

Dr Bentley makes an interesting note on the seasonal conception curve. Conceptions in Bengal are

at a minimum in November before the *kharif* harvest is reaped and reach a maximum in June after the *rabi* harvest. In all the divisions of the province the death rates have fallen except in Dacca, where the death rate is stationary.

In regard to the death rate of rural towns the numbers registered are in many cases absurd. The death rate in Calcutta was higher than elsewhere because of better registration.

The registered infantile mortality is 206 for the province. This is probably an underestimate. Special investigation showed that even under favourable conditions the infantile mortality was about 160 while it could reach the actual appalling figure of 700. These infants are in many cases needlessly sacrificed to the ignorance of the village *dais*.

Coming to actual diseases it is specially gratifying to note that cholera appears to be on the decline in Bengal. This fact is of great importance not only to Bengal but to the whole of India and indeed the world at large. This reduction is due to increased activity in public health administration, both central and local during the last few years. With increasing activity of administration and propaganda work a further increase may be looked for. Cholera still however contributes 57 per cent of the total mortality of the Province. The seasonal incidence of Bengal cholera is extremely interesting. It is at a minimum in September. It gradually rises to a first maximum in December, it then declines somewhat in February and then rises to its maximum in April and then rapidly declines with the onset of the rains. The explanation of these phenomena is not obvious and would repay close investigation. It is in direct contrast to Madras cholera, which also has two maxima but these occur at the height of the two monsoons. A detailed study of the incidence throughout the province elicits the fact that certain areas are particularly prone to be endemic centres and in these specially active measures would appear to be necessary.

Small-pox.—A very important feature in the epidemiology of small-pox is its periodicity of recurrence in epidemic form. It tends to recur in epidemic form every five to six years and of these recurrences every fourth one is likely to be more severe than the others. Between these recurrences the disease is more or less quiescent. This periodicity is a feature more or less in all provinces but all provinces do not have these recurrences in the same year, so that we may have the phenomenon of small-pox appearing in a virulent epidemic form in one province while the neighbouring province is more or less free. A similar phenomenon may be found in the different districts of the same province. Small pox in Bengal is at its maximum during the first six months of the year, March, April and May being ordinarily the months of greatest intensity. A definite increase in incidence in November and December usually foretells the appearance in epidemic form in the ensuing year. A detailed study of Bengal small-pox figures shows that there are two main centres of prevalence one in the West of which Calcutta is the centre, and the other in the North East. From Calcutta and Howrah and the 24 Parganas it is carried by rail to other places. Mymensingh, Dacca and Murshidabad appear to be endemic districts and vaccination should be pressed especially in these places.

Fever.—Since 1921 an attempt has been made to give definite subheads to this large main heading, malaria, kala-azar, enteric, influenza, measles and pneumonia, which all used to be classified as fevers, are now entered under their own headings.

Dr Bentley is of opinion that about 50 per cent. of fever deaths are due to malaria. Enteric fever is certainly under-estimated and the figure of 8.5 for Calcutta is probably applicable to the province as a whole. Relapsing fever is only a serious cause of mortality in Darjeeling District.

1552 deaths from kala-azar were reported. This is certainly an under-estimate. Taking the kala-azar death

rate of Calcutta, viz., 0.2 per mille and applying it to the whole province the deaths from kala-azar cannot have been much short of 10,000.

The kala-azar survey was continued during 1921. As a result of these investigations it is represented that among 2,807 villages examined 639 or 22.7 per cent were found to be infected with kala-azar and an average of two cases per village was found. The statement that "parasites have been found in the peripheral blood in 80 per cent of cases" may need some revision in the light of results obtained by other workers.

The seasonal curve of fever mortality is important. It is at a minimum in the rains in the months of July and August, in September it begins to rise, reaching a maximum in December and January after which it declines to a second minimum in February. It again rises through March to a second smaller maximum in April, declining with the onset of the rains to the July to August minimum. It follows the curve of total mortality and Dr Bentley appears to think that it follows more the curve of variation of prices than the curve of climatic changes.

Dengue appears in April to July but its influence on mortality would not appear to be of very great moment.

Plague in Bengal would appear to show a tendency to recur every 7 or 8 years. It is usually not imported, though it appears in a spasmodic fashion in Calcutta.

Under 'respiratory diseases' are now classed many cases that would have been included in the old "fevers" heading. The deaths from phthisis are certainly under-estimated and as care in registration of deaths increases, so will we expect phthisis returns to increase, but this will not necessarily mean an increased incidence.

Dysentery and diarrhoea mortality is under-estimated by six times probably. The chief centres of distribution are Calcutta, Howrah and Darjeeling.

An interesting note is given on the progress of the various anti-malarial experimental schemes now being carried on in the province. In the *Jangipur Flood and Flush Scheme* the progress since 1917 is reflected in the decreased death rate and lowered infant mortality, whilst the malaria death rate has dropped by over 50 per cent. There has been a corresponding reduction in the spleen index and in the number of anophelids caught in the district.

Banka Valley Scheme.—The operations of the scheme have resulted in better crops, lowered death rate and decreased spleen index.

Meenglass Scheme.—This scheme illustrates the difficulty of carrying out anti-malarial measures in a small area situated in the midst of a large malarial district where such measures are in abeyance. A decreasing population and immigration of mosquitoes from outside were the two factors tending to retard anti-malarial efforts. Nevertheless here, as in the Singaran scheme where conditions are in many ways similar to Meenglass, facts and figures would apparently justify the belief that malaria is on the down trend in these areas. Special malaria work was carried out by inspectors in tea-gardens, collieries and municipalities and observations continued at the special malarial observatory at Sonarpur. Special mention must be made of the work carried on by the anti-malarial co-operative societies. Local branches are formed in villages in malarial localities the members voluntarily undertake anti-malarial work and treatment is arranged for. The movement is under the able guidance of Rai G. C. Chatterjee Bahadur and is one of the most promising signs of awakening interest in disease prevention on the part of the people themselves. This augurs well for the future.

Special success has been achieved in the sanitary arrangements for Fairs and Melas. The Ganga Sagar Mela occurs at the height of the cholera season and is a yearly menace not only to Calcutta but to Bengal and many neighbouring provinces. The low cholera incidence testifies to the adequacy and care taken in the sanitary arrangements.

The Local Self-Government Act has given great power and opportunities to local bodies, not the least of which

is that of improving the sanitation of the areas in their charge, in improving the purity of water supplies and guarding the quality and freedom from adulteration of foods and food-products. It is doubtful if the majority of these local bodies as yet realise their duties, responsibilities and opportunities, and it is hoped that their members will read carefully the report of the administration of the public health of their province, they will benefit greatly in knowledge thereby and it is hoped be stimulated to further exertions on behalf of the communities, the direction of whose public matters are in their charge.

A D STEWART

REPORT ON THE JAIL ADMINISTRATION OF ASSAM FOR 1922

By COLONEL C H BENSLEY, I M S,

Inspector-General of Prisons, Assam Assam Secretariat Press, Shillong Price, Re 1

THE real student of Indian affairs,—as distinct from the demagogue, who merely prates about them,—would do well to study this and similar reports, although their study will probably leave him with a feeling of despair. Assam is potentially one of the wealthiest provinces in India yet her potential wealth is to-day only partly opened up, the proceeds of the tea duty which is levied on her most important industry go to Imperial and not to Provincial revenues, and the Province is to-day suffering from a condition of acute financial stringency, which is mirrored in this report.

During 1922, the office of the Inspector-General of Prisons, Assam, changed hands several times being held in turn by Colonel J Garvie, R N S I M S, Colonel R Heard, V N S, I M S, and Lt-Colonel H Innes, I M S. Colonel Bensley took over charge early in 1923, and his report for 1922 is a carefully worded and studiously refrained document, which nevertheless shews an admirable grasp of a difficult situation and a determination to grapple with it. The main interest of this report lies in its covering letter from the I G of Prisons to Government, and in the Government resolution on the report. The necessity for making bricks without straw is no new idea to officials of the public services in India we have rarely however seen it more forcibly expressed than in this report. Indeed the opening sentence of the Government resolution opens with words which are already becoming only too familiar in such official documents—"The Governor in Council desires to express his regret that the financial stringency which is thwarting the earnest desire of Government to carry out important projects of development in all branches of the Public Service, has prevented him from giving effect to the larger schemes of reform which have been advocated by the Indian Jails Committee and accepted in principle by Government." If the future of India depends upon a balanced Imperial budget the future of even the absolutely essential services in the provinces also depends upon financial stability being reached in the near future.

Assam contains 11 district and 9 subsidiary jails. At the commencement of 1922 the total number of prisoners in confinement was 3,094 as against 2,643 at the commencement of 1921. The daily average population in the jails was 2,915 as against 2,656 in 1921. The increase in both figures is the result of the non-co-operation movement and the total cost of the Department was Rs 3,90,299 as against Rs 3,68,812 in 1921, in spite of which the average cost per head fell from Rs 138-13-3 in 1921 to Rs 133-14-1 in 1922. It is characteristic of the care with which prisons are administered in India to read that 54 per cent. of prisoners gained weight during the year, 23 per cent. remained stationary in weight, and only 23 per cent. lost weight. With the subsidence of the non-co-operation movement however prisoners were released and the year closed with only 2,615 prisoners of all classes under confinement.

The report notes that the number of short term

sentences inflicted by magistrates is unduly high and the Government resolution points out that such sentences are rarely deterrent, that they involve the mingling together at least during the daytime of short term and habitual prisoners,—a state of things to be deplored but at present inevitable until separate accommodation can be provided,—and involve undue expenditure. In the matter of sentencing juvenile offenders also the report comments adversely on the admission of such offenders to general jails, whilst the Government resolution draws attention to instances of magistrates not accepting the opinion of medical officers in determining the age of accused. "It is unfortunate that it is impossible to segregate the various classes of prisoners from one another," writes the Inspector-General, "until new construction is undertaken I am afraid there is no remedy for this very unfortunate condition of affairs."

The report notes that at the end of the year the jails provided accommodation for 3,377 prisoners as against 3,187 in 1921. This is due, however, not to new construction, but to what is euphemistically termed "temporary" accommodation,—accommodation which under such conditions, is liable to come into permanent use for which it is unfitted. "I find," writes the Inspector-General, "that most jails in this Province shew ordinary accommodation and temporary accommodation. There should not, of course, be such a thing as temporary accommodation anywhere. Emergency accommodation can always be found in any jail, but this temporary accommodation in jails of this Province is of a permanent nature. It means that various means, such as the provision of flimsy buildings or the conversion of ground spaces under barracks into sleeping wards and workshops have been resorted to, and that jails have to accommodate a larger number of prisoners than that for which they were originally built." And the result is evidenced in the sick rates—daily average sick 427 per mille in 1922 as against 3975 in 1921, and death-rate 2298 per mille in 1922 as against a provincial general rate of 2685. In spite of difficult circumstances it speaks well for the jail administration in Assam that these figures compare favourably with the figures for the preceding three years and with those for the jails of other provinces. Yet "an admission of 50 with 16 deaths from pneumonia, and of 19 with 9 deaths from tuberculosis cannot be lightly passed over. Of these deaths 7 from pneumonia and 4 from tuberculosis occurred in Gauhati Jail, where under-barrack sleeping wards and workshops exist.

Jails generally in this Province have been constructed on a bad type, and the provision of new jails or the conversion of some of the existing types into larger and more up-to-date jails, as well as the provision of special jails for adolescent prisoners and a special tubercle jail, are lines along which development should take place." Unfortunately, until finances permit, such desiderata are as unattainable as the moon, and the lesson is driven home when we read that the project for the construction of a central jail at Jorhat has been abandoned, and that even the bricks which had been collected on the site for its construction have been sold,—a fact which the Inspector-General, probably with reason, regards as almost a postponement *sine die*.

The number of escapes from prison was high, 17 in 1922 as against an average of 9 for the previous four years. 13 of these prisoners, as well as one who had escaped prior to 1922, were re-captured during the year. It might be expected that such escapes would most frequently occur from among the prisoners employed on extra-mural work, and the Inspector-General emphasises "the objections to this form of labour, which are patent to all. One of these objections is that it is impossible to furnish guards for the gangs without very much overworking the warders. I have actually found that warders are not being drilled or trained in the use of fire-arms because they cannot be spared from their duties for the purpose. This is a very serious state of affairs, and it is one result

of the employment of prisoners extra-murally, which leads to serious loss of efficiency among our guards" On the other hand such labour is remunerative to government, and if the extra-mural tasks were done away with there would be difficulty in finding tasks for all the prisoners inside the jails We read however that of the 17 escapes only 7 occurred from outside the jail walls, and no less than 10 prisoners escaped from within the jails The Government resolution points out that as the strength of the warder staff and the number of working hours remained approximately the same in 1922 as in the previous year, this indicates carelessness to some extent and this is admitted On the other hand the Inspector-General clearly considers that there are other and more important causes "The high number of escapes is partly attributable to faulty construction of barracks and enclosure walls, but is in the main due to understaffing The strength of the warder guard is very much below requirements, with the result that the guarding of prisoners is in the hands of men who are chronically tired It is very difficult to get men on account of the poor conditions of service I do not think it is that the pay is inadequate so much as the long and wearying hours of duty I have only seen three jails in this Province but in these I found warders on duty all day long and also on duty on one watch every night in the week Let any one who reads this try these hours of duty for a week and see how he feels at the end of it In addition to this the deadly monotony and the sordid surroundings in which these duties have to be carried out One cannot wonder that recruits of a good type are not forthcoming the wonder is that recruits of any type at all apply Such words apply not merely to Assam but to other provinces of India and the difficulty in obtaining warders of the right status is experienced elsewhere also In fact conditions in this service are such that in many jails the warder staff are in a state of chronic discontent One is glad to note that this question is receiving the attention of government Every jail superintendent knows how difficult a matter it is

The gross profits in the jail manufacturing department increased from Rs 78 572 in 1921 to Rs 84 512 in 1922 but there was a fall in the actual cash receipts on account of increase in the amount of bills outstanding and in the value of raw material in hand at the close of the year also in that the sale proceeds of bricks manufactured in 1920 were credited to 1921

If we have dealt at some length with this report it is because we feel that it mirrors conditions not in one but probably in other provinces of India also because these conditions are here not glossed over but are vigorously represented The report does not indicate carelessness and neglect of duty on the other hand it indicates a considerable degree of efficiency of administration under conditions of increasing difficulty and strain Ways and means may seem a negligible matter to politicians on the stunt but this and other official reports emphasise how vital it is to the country to relieve the financial embarrassment of the provinces

Correspondence

THE BRITISH MEDICAL ASSOCIATION

To the Editor of THE INDIAN MEDICAL GAZETTE

SIR—The recent appeal of the British Medical Association for increased membership calls for some support from the Indian Medical Service, if only in gratitude for its past services in fighting our battles as regards pay and the privileges of private practice.

When the B M A Roll of Honour was published a few months ago, one noticed many omissions of the

names of I M S Officers who had fallen in the War, and, on enquiry, was informed that only one was an omission from oversight, the rest were not members of the Association

I think the majority of I M S men who do not join the Association are those from elsewhere than the London, or at any rate English medical schools

It is unnecessary for me to sing its virtues, but the Journal alone is remarkably good value for two guineas a year, apart from other benefits

I trust you, Sir, will use the weight of your influence to support the appeal

If the B M A has been unable to save the service from its present unhappy position of lost popularity at the home medical schools, it cannot be laid to their charge, and—after all—our service is no worse off than any other under the Reforms

MEFRUT, U P
3rd July, 1923

Yours etc,
C H REINHOLD,
Major, I M S

ELECTROLYTIC CHLOROGEN

To the Editor of THE INDIAN MEDICAL GAZETTE.

SIR—I have received the enclosed letter from Mr Hutchinson of Pusa in regard to the remarks on Electrolytic Chlorogen contained in the report of my paper on "The Selection of a Disinfectant" in the May issue of the Gazette Whilst I am not entirely in agreement with Mr Hutchinson in his estimation of costs based only on a phenol coefficient,—(Lysol, for instance, is extensively used by gynaecologists on account of properties apart from its bactericidal value),—I think the economic aspect of this disinfectant as brought out in Mr Hutchinson's letter is important enough to bring to the notice of your readers

I would also take this opportunity of correcting a slip on page 225 Cyllin, though it has a high phenol coefficient, does not form a good emulsion in salt solution

Yours etc,
A D STEWART,
Major, I M S

10th July 1923

Director, Bengal Public Health Laboratory

DEAR MAJOR STEWART,—I have read an account, in the Indian Medical Gazette, of your very interesting lecture on antiseptics to the Medical Section of the Asiatic Society I note that you very kindly made an appreciative reference to my electrolytic hypochlorite solution 'E C' and I was pleased to see that you agreed with me in considering the comparatively low chlorine content that I have aimed at as having practical advantages On the other hand I was sorry to find that you are of opinion that the price of the apparatus made by Messrs Mather & Platt is so high as to render it improbable that this method of obtaining a supply of an indigenous antiseptic is likely to come into general use I think if you take into consideration some of the economic factors involved, which may not have come to your knowledge, that you will probably revise this opinion, and as it appears to me desirable that a recognised authority on this important subject should be fully informed on the economic side of this question of the value of "E.C." I am taking this opportunity of placing some few facts before you which have a direct bearing on this point.

The standard hospital set at the price which you quoted in your lecture, i.e., Rs 3,000/—, turns out 4 gallons of E. C per 8-hour day, or say 1,200 gallons per annum the cost of which including interest and depreciation at 10 per cent, works out at an outside figure at 8 annas per gallon

The antiseptic efficiency of E. C., according to recent tests made at Kasauli by Col Christophers and Major King gives it a carbolic coefficient (R W test in broth) of 39 this may be compared with lysol which has a carbolic coefficient of 16 E. C. is, therefore, four times

as efficient as pure phenol and $2\frac{1}{2}$ times as efficient as lysol

If the relative costs of these three antiseptics are compared, we get the following figures —

Taking the cost of the 1,200 gallons annual output at annas 8 this will be Rs 600

At the carbolic coefficient of 3.9 (or say 4, this will be the equivalent of $1,200 \times 10 \times 4 = 48,000$ lbs carbolic acid at Re 1/8 per lb = Rs 72,000

Or if lysol is used then
1,200 gallons E. C. = $1200 \times 2\frac{1}{2}$ gallons lysol
3,000 gallons lysol at Rs 10 per gallon = Rs 30,000

For a capital expenditure of Rs 3,000/- therefore an annual saving of the order above set forth may be expected, the only proviso being adequate arrangements for distribution and use of the output of the apparatus, which can actually, by running longer hours be made to give a still higher return on the original outlay. I may say that at the present moment one set of this apparatus the property of the Government of Bihar and Orissa, is supplying six hospitals in that Province and has shown in over two years use of this antiseptic an average annual saving of Rs 1,500/- in each hospital on surgical antiseptics alone.

In addition to this duty, the same apparatus is providing E. C. for sterilizing village wells under the directions of the Health Officer and as the cost of the antiseptic for this purpose is less than one anna per well and its use does not result in giving the water the objectionable flavour associated with "bleach" nor the colour of permanganate you will agree that for both these reasons expenditure of this amount of capital might be justified if only as a preventive of cholera. I consider, therefore, that the first cost of this apparatus should be of small importance when such savings as I have shown above can be realised by its use.

I should perhaps mention that the initial apparently high cost of the Electrolyser is mainly due to the use of pure platinum electrodes which not only give the apparatus permanence and stability, but are essential for the production of the characteristic concentration and stability of E. C.

I trust that I have given satisfactory reasons for a revision of your verdict on the prohibitive price of the apparatus for making E. C.

Yours sincerely

C W HUTCHINSON, C.I.E.

IMPERIAL RESEARCH INSTITUTE, PUSA

5th July, 1923

TETANUS IN INTESTINAL CASES

To the Editor of THE INDIAN MEDICAL GAZETTE

SIR,—Having read the article in the *I M G* for May 1923 reported by Major Porter on "Intestinal Obstruction Complicated by Tetanus," I beg to record two cases something like this one, during my practice of about 20 years. These cases I briefly describe below, the picture is so vivid in my memory to-day that it is very difficult to forget.

Case No 1 Year 1907

A boy of about 16 came from Bombay to Hyderabad (Sind) when I was a teacher in the Medical School there. He was seen by a number of doctors in Bombay for his complaint. He had a painful and tender lump in the middle part of the left rectus abdominis muscle. It was very difficult to diagnose what that lump was. After some 20 days we decided to put a needle in it and it was found that there was pus in the abdominal cavity. The boy was at once operated upon with thorough antiseptic precautions. He progressed well for three days. On the 4th day he developed tetanus with only lock-jaw, no convulsions and died on the 5th day.

Case No 2 Year 1913

An adult of about 24 Diagnosis —strangulated inguinal hernia, right side Operation —radical

cure 9th day sutures removed, wound healed by first intention. On the 12th day after operation, i.e., 3 days after removal of sutures, he wanted to go home, but I detained him with advice to go after a full fortnight. On the 13th day, four days after removal of the sutures, he developed lock-jaw, on the 16th day he died. The whole area of the healed wound was dissected out and sent with embedded sutures—(silk used for tying the sac)—to Parel Laboratory. Result negative, no tetanus organisms found.

The above two cases are very difficult to explain. I also think that the human intestinal canal may harbour tetanus bacilli or spores and these may take a virulent turn if any trauma be inflicted in the neighbourhood of the gut.

Yours, etc.,

D J ASANA, I.M.S. N.M.S.,
B J Medical School Ahmedabad

12th June, 1923

FILARIAL HAEMOPTYSIS

To the Editor of THE INDIAN MEDICAL GAZETTE

SIR—Whilst reading the issue of the *Indian Medical Gazette* for April 1923 I came across an article written by Dr R. N. Banerjee Allahabad, on "Filaria and Haemoptysis."

I know of a similar case, a medical student from the Grant Medical College, Bombay. The patient had severe haemoptysis and the case was suspected to be one of tuberculosis. The patient was put under the care of the late Dr N. F. Surveyor, M.A., B.Sc., M.D., D.P.H. then acting second physician to the Sir J. J. Hospital. He diagnosed it to be a case of filariasis on blood examination. The patient ultimately recovered under symptomatic treatment.

Yours, etc.,

B A VAIDYA, M.B., B.S.

ITWARI DARWAJA,

NAGPUR CITY,

28th June, 1923

Service Notes.

OBITUARY

LIEUT.-COLONEL JAMES CURRIE ROBERTSON, C.I.E., G.M.G.,
C.B.F., I.M.S.

THE death of Lieut.-Colonel J. C. Robertson at Simla from heart failure following pneumonia, on May the 14th 1923, deprives the Indian Medical Service of a forceful and vigorous personality. The son of Alexander Robertson of Kilmarnock, he was born in 1871 and educated at Glasgow, where he took his M.A., in 1890, his M.B. and C.M., with honours in 1894, and also his B.Sc. He entered the I.M.S., in January 1896, and first saw active service in the Sudan campaign.

Almost all Colonel Robertson's service was spent in the Sanitary Department. After being placed on special plague duty he served in S. Africa in 1901-2 on special duty under the Director of Burgher Camps. From being Deputy Sanitary Commissioner, N.W.F. Provinces, he was promoted in 1912 to be Sanitary Commissioner with the Government of India, in which position he was closely associated with the welfare of the Bacteriological Department, the *Indian Journal of Medical Research*, and the Indian Research Fund Association. In February, 1915, he returned to military duty and in 1916 was in charge of the measures against epidemic plague in Malta, his services in this capacity being especially brought to the notice of the Government of India by Lord Methuen. In 1917 he was posted to Taranto, with the acting rank of colonel. Here he succeeded in converting a veritable hot bed of malaria into a military cantonment, used for many months as a base for British troops in the Mediterranean operations. In 1920 he was appointed Director of Hygiene and Pathology at Army Headquarters,

Simla and had been granted furlough and was on the eve of his departure from India when attacked by his fatal illness. There are many in the service who will look back to Colonel Robertson's devoted labours on behalf of medical research work and public health in India and who will deeply regret the loss of one who was not only a distinguished sanitary officer, but also an entertaining host a born raconteur, and a loyal Scotsman.

Extract from Government Orders

Office of the Director-General Indian Medical Service
Circular No 1-C

Simla dated the 14th July 1923

It has recently been pointed out by the India Office that officers of the Indian Medical Service have undertaken courses of study in the United Kingdom without first submitting their programmes of study for the approval of the Director-General, Indian Medical Service or the India Office. As stated in this office circular No 1-C dated the 11th July 1921, this practice is contrary to the study leave rules and the attention of I M S. officers is therefore invited to paras 7 and 8 of the regulations regarding the grant of study leave quoted below.

R C MacWATT,
MAJOR-GENERAL I M S.,
Director General Indian Medical Service

7 Except as provided in Rule 8 all applications for Study Leave shall be submitted with the audit officer's certificate, to the Director-General, Indian Medical Service through the prescribed channel and the course or courses of study contemplated and any examination the candidate proposes to undergo shall be clearly specified therein.

8 Officers on furlough who wish to have part of their furlough converted into Study Leave should address the Under Secretary of State, India Office, and should furnish a statement showing how it is proposed to the Study Leave. Similarly, officers on furlough or other leave who desire to have it extended for purposes of study, should address the Under Secretary of State but in addition to the statement of the proposed study they must support their applications with documentary evidence of their having obtained the approval of the authorities concerned in India to their applying for an extension of leave.

APPOINTMENTS AND TRANSFERS

SENIOR ASSISTANT SURGEON AND CAPTAIN A T TORIA I M D is appointed to hold charge of the Medical Store Depot Lahore Cantonment, in addition to his own duties during the absence on privilege leave of Captain E S Goss I C I M S with effect from the 4th June, 1923.

CAPTAIN IFHANGIR PESTONJEE CANTENWALLA I M S, is appointed to be Officer in charge Medical Store Department Calcutta with effect from 25th May, 1923.

MAJOR JAMES BURNE LAPSLEY, M C M B I M S is appointed to be Officer in charge, Medical Store Depot, Madras with effect from 30th May, 1923.

CAPTAIN ROBERT SWEET D S O M B I M S, is appointed to be Assistant to the Officer in charge Medical Store Depot Madras with effect from 30th May 1923.

THE SERVICES OF MAJOR E S PHIPSON D S O M D I M S are placed temporarily at the disposal of the Government of Bombay for employment as Port Health Officer Aden.

CAPTAIN J R D WEBB O B E D P H I M S is appointed temporarily to be Health Officer Simla with

effect from the date on which he assumes charge of the duties of the post.

MAJOR M L PURI, I M S, made over charge of the duties of Superintendent of the District Jail at Campbellpur, to Major W C M Charters, I M D, on the forenoon of the 30th May, 1923.

LIEUTENANT COLONEL D P GOIL, I M S, made over charge of the Ryshrh Central Jail, to Civil Assistant Surgeon Pratul Pati Ganguli on the afternoon of the 6th June, 1923.

THE SERVICES OF CAPTAIN S A McSWINEY, M B, I M S are placed temporarily at the disposal of the Government of Bengal with effect from the date on which he assumes charge of his duties.

THE SERVICES OF CAPTAIN A C L BILDERBECK, M B, I M S are placed at the disposal of the Government of Burma for appointment as Assistant Director of Public Health with effect from the date on which he assumes charge of his duties.

LEAVE

LIEUTENANT-COLONEL I L MARJORIBANKS, M D, I M S, Health Officer of the Port of Aden, is granted leave on average pay for ten months combined with leave on half average pay for eighteen months, with effect from the date of relief.

LIEUTENANT-COLONEL B B PAYMASTER, I M S, Superintendent Matheran, is granted leave on average pay for three and half months, with effect from the date on which he avails himself of it.

MAJOR R S TOWNSEND, I M S, Civil Surgeon, leave (on average pay for eight months followed by leave on half average for four months) for a total period of one year with effect from the date he availed himself of it.

LIEUTENANT-COLONEL H W ILLIUS C I E, F R C S E, I M S, Civil Surgeon Benares, leave on average pay for five weeks with effect from the date he avails himself of it.

LIEUTENANT-COLONEL C F MARR, M B, I M S, Officer in charge Medical Store Depot, Bombay, is granted combined leave for one year, including privilege leave for one month and 21 days, with effect from 1st July 1923, or subsequent date of availing.

LIEUTENANT-COLONEL G E STEWART, M B, F R C S E, I M S, Superintendent and Civil Surgeon, Mahabaleshwar, is granted leave on average pay for three months with effect from the 12th June 1923 or the subsequent date of relief.

RESIGNATION

CAPTAIN EDWIN WALTER MARSH is permitted, subject to His Majesty's approval, to resign his temporary commission with effect from the 17th February 1923 and to retain his rank.

NOTICES

MESSRS HICKS' THERMOMETERS

MESSRS J J HICKS London, whose advertisement appears on page xxv of this issue are recognised as being the premier thermometer makers of the world. Their world wide business has been built up by their guarantee of accuracy every thermometer being tested by an expert before leaving their factory.

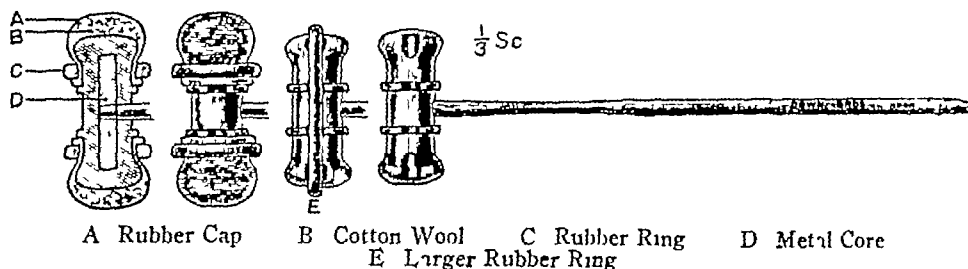
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THE illustration below shows a Percussion Hammer which is almost universal in its methods of application and it is hoped that the diagnostician will be able to employ any of the processes of this method without having to change his instrument

By means of small rubber caps and rings which fit over the end of the instrument it can be used with either a hard or soft surface, the end of the hammer head can be used for percussing a small area, or the head turned sideways for percussing a large area, and the hammer possesses the additional advantage that it can be easily used for detecting thermo-anæsthesia in such a way as to make deliberate error in the patient's answers easy to detect

Below is a detailed description of the method of use —



A Rubber Cap B Cotton Wool C Rubber Ring D Metal Core
E Larger Rubber Ring

It can be used —

(1) For the ordinary methods of percussion
(2) For the detection of certain diseases of the nervous system (1) For ordinary percussion in defining the boundaries of the heart (superficial and deep dullness) and other internal organs, *e.g.*, the liver, or for the condition of the lung, *e.g.*, in tuberculosis. The force of percussion can be varied owing to the flexibility of the handle. The mallet head may be used plain or covered by the rubber capsules, or a small plug of cotton-wool or a sponge may be inserted under the capsule so as to modify the stroke

(2) For eliciting the nerve reflexes the hammer can be used as above, or the longer rubber ring may be applied along the entire length of the mallet head

It can be used for percussing at either end of the head or along its side, thus affording a more extensive surface (like the edge of the hand) for eliciting the knee-jerk either at the patella or higher up above the knee

The padded extremity is also useful for obtaining the jaw reflex, the supinator or pronator wrist-jerks and the adductor foot-reflex by striking (with the extremity of the mallet head) along the border of the foot towards the heel

The instrument is especially suitable for testing thermo-anæsthesia which is necessary in the diagnosis of syringo-myelia, syringo-bulbia and for Brown-Squard's syndrome. The pointed and rounded extremity of the handle enables the plantar extension-reflex (Babinski's sign) to be readily tested for

By inserting a pledget of cotton-wool or a small sponge wetted with cold water at one extremity of the mallet head under the capsule (fixed with a small rubber ring), and similarly with warm water at the other the sensations of heat and cold are readily tested and the appearance of both ends being similar the patient cannot detect except by sensation which extremity is warm or cold

The instrument maintains its temperature for some time and so enables repeated tests to be made without further manipulation. The shape of the hammer prevents it rolling off the table. It is neither rigid throughout, nor heavy. It is well-constructed and neat and suitable for the consulting room. The sole makers are Messrs Down Bros Ltd 21 and 23 St Thomas's Street, London, S E 1

THE "DEPOSE TEKA" THERMOMETER

We have received from the Bombay Medical and Surgical Stores 19, Bank Street, Bombay, a type of thermometer which appears to solve the problems of

accuracy and asepsis. The "Depose Tekka" thermometer, when not in use is always in a disinfectant liquid and can be comfortably carried in the pocket. The thermometer is always aseptic and can be used without the slightest risk of infection

The thermometer is held in a glass vessel in the shape of a test tube, which is filled with disinfectant liquid and can be hermetically closed. This enables the doctor always to carry the thermometer and the disinfecting bath with him and to sterilise the thermometer each time after use on different patients. The glass vessel holds the thermometer securely and prevents shaking. The whole is contained in a nickel coated metal case. The accuracy of the thermometer has been officially tested. In using the thermometer it is only necessary to remove the cap from the end of the vessel and to draw out the thermometer by turn

ing it by the knob and to close the vessel again with the cap. After use the thermometer is put back into the vessel and thereby rendered absolutely antiseptic for further use

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"Hypoloid" "Infundin" (*New Standard*) is supplied in hermetically sealed containers of 0.5 c.c. and 1 c.c. in boxes of six. Care should be taken to specify *New Standard* when ordering, otherwise the *Original Strength* which is equivalent to 17 per cent extract is always supplied

Notice.

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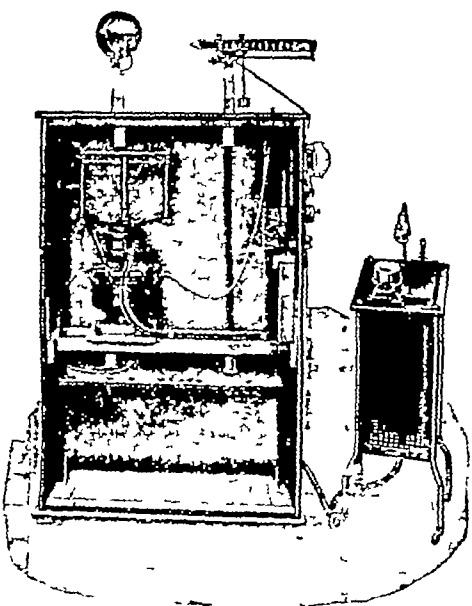
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Dr. B. GANGULY, M.B.

MANAGING DIRECTOR

135, Prinsep Street, CALCUTTA.

Original Articles.

CARBON TETRACHLORIDE IN PHARMACOLOGY AND THERAPEUTICS*

BY R. N. CHOPRA M.A., M.D. B.Ch. (Cantab.),
MAJOR, I.M.S.

Professor of Pharmacology,
and

J. BORLAND McVAIL, M.R.C.S. (Eng.), L.R.C.P.
(Lond).

In charge Hookworm Research, Calcutta School of
Tropical Medicine

INTRODUCTORY

CARBON TETRACHLORIDE was first discovered in 1849 and, after the discovery of chloroform as an anæsthetic, was given a trial by Simpson. It was, however, found to be more toxic than chloroform and the anæsthesia produced by it was unsatisfactory and it was abandoned. The only other therapeutic use made of this substance was as an inhalation in hay fever. For fifty years after its discovery it was not used except as a solvent for rubber, sulphur, fats, etc., and as a fire-extinguisher. Cases of poisoning have been recorded in a woman who used it as a hair wash and in a girl who worked as a painter of golf balls, the solvent used for the paint having been carbon tetrachloride.

Carbon tetrachloride is a colourless, volatile, non-inflammable liquid having a sweet penetrating, disagreeable and pungent odour. It has a specific gravity of 1.629, a molecular weight of 153.8, contains 0.001 per cent of non-volatile matter and no free chlorine. It is only slightly soluble in water—1 in 1250 parts at 25°C. as compared with 1 in 161 of chloroform at 22°C. and 1 in 526 of carbon disulphide at 25°C., but it is freely soluble in alcohol and ether.

Maurice Hall, Zoologist of the Department of Agriculture in the United States, was the first to try this drug against hookworm in the dog, and he was so successful with it that he suggested its use in ankylostomiasis in man. He found by experiments on himself and on monkeys that the drug was not very toxic when taken by the mouth, and that 3 c.c. could be given to an adult man without untoward symptoms. Dogs treated with doses of 10 c.c. without an accompanying purgative showed no symptoms except occasionally dizziness, abdominal distress and vomiting. Hall gave doses as large as 16 c.c. per kilo body weight to dogs and 20 c.c. per kilo to chickens without producing marked symptoms. The drug has a low volatility and solubility and for this reason it is not absorbed in sufficient quantities to do harm. 5 to 12 c.c. given to criminals

awaiting execution on various occasions failed to produce any symptoms except giddiness. No pathological changes were found in the liver, spleen and kidneys of these persons.

Since these facts have come to light, the drug has come into use extensively. In India, hookworm is very prevalent and in some parts of the country such as Bengal, Assam and the United Provinces, the incidence is as high as 90 per cent. This brings down the standard of health and as labour forces are mainly affected serious economic loss is the result. The importance of carbon tetrachloride owing to its cheapness is very great to this country and the present investigation was undertaken to work out its pharmacological action and toxicity.

Our first difficulty was to obtain chemically pure specimens of this substance. The drug as obtained locally often contains appreciable quantities of carbon bisulphide and organic impurities. It is said that another common impurity is phosgene (carbonyl chloride), but Major Boyd, I.M.S., Chemical Examiner to the Government of Bengal, who very kindly did all the chemical work in connection with this enquiry, did not find this compound present in the 10 samples he examined. Since contamination with such impurities brings in other factors and also enhances the toxicity, we used samples specially purified for us by Major Boyd in all our laboratory experiments.

PHARMACOLOGICAL ACTION

Action on protozoa. Carbon tetrachloride, like chloroform, is a general protoplasmic poison. A 1 in 3000 solution killed *Paramæcium caudatum* instantaneously and 1 in 5000 in 10 minutes, in higher dilutions the organisms were not killed even after an hour. Free living amœbæ of the *Amœba* type are killed immediately by a 1 in 3000 solution, the amœbæ roll themselves up into balls and the movements cease. 1 in 4000 kills them in 5 minutes, higher dilutions are ineffective.

We also tried the effect of the drug *in vitro* on some of the intestinal protozoa. The movements of *Chilomastix* cease immediately in 1 in 4000 and the animal dies, higher dilutions are ineffective. *Giardia intestinalis* is not touched by these dilutions. On *Trichomonas* from a culture from a *Macacus rhesus* monkey even 1 in 1200 had no effect in 10 minutes. The toxicity of the drug to the intestinal protozoa is therefore low. These observations are in accord with the clinical results obtained by Hogue and Winkle, who tried it in several cases of such infections in doses of 3 c.c. and found it ineffective.

Externally when applied to the skin it produces a feeling of burning and when rubbed into it is a rubefacient and irritant, especially if evaporation is prevented. On the mucous membrane these effects are much more marked.

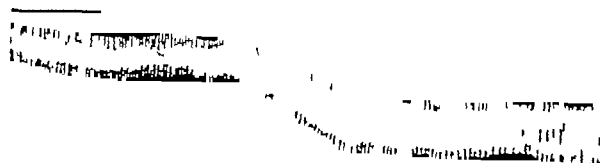
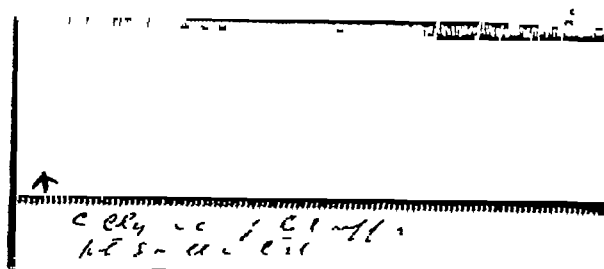
* A paper read at the meeting of the Medical Section of the Asiatic Society of Bengal on Wednesday, the 9th May, 1923.

Internally in the mouth it has a pungent burning taste, in the stomach it gives rise to a sensation of warmth and the normal movements of this organ are stimulated. In the intestine it causes a distinct increase of peristaltic movements. Graph I shows the effect of the introduction of 1 cc of carbon tetrachloride directly into the upper portion of the

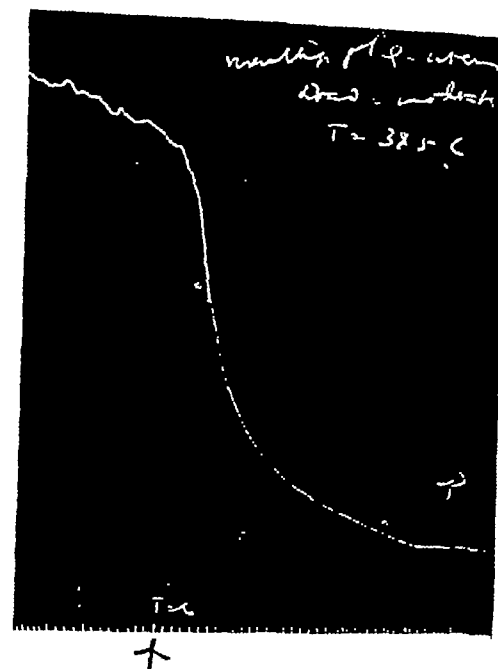
Similar effects were also observed on the isolated uterus of the guinea-pig and rabbit, the automatic movements of this organ were slowed and their amplitude was decreased. If the uterus was contracted, as was done with hordenine and pituitrin, immediate relaxation was produced by such concentrations as 1 in 175 000. Graph II shows the effect of 1 in

GRAPH I

GRAPH II

B P
(carotid)Intest
volTime =
6 secs

Cat—1800 gms Peristaltic movements increased

CCl₄ 1 in 40,000
Uterus contracted with hordenine—relaxation

small intestine of a cat. The volume and movements of the intestine were recorded by an oncometer connected with a tambour, the peristalsis was increased. After a large dose in dogs it is not uncommon for the animals to pass a stool in an hour or two which may contain mucus. Blood may be passed in the stools, especially if large divided doses are given for prolonged periods.

It has been said that carbon tetrachloride does not depress voluntary muscle and increased peristaltic movements appear to have been attributed to its stimulant action. From our experiments it is clear that the stimulant effects produced on the movements of such organs as the stomach and intestine are purely reflex, being produced by the irritant action on the mucous membrane of these viscera. There is also a reflex rise of blood pressure followed by a fall if the irritation is excessive. In our experiments on dogs we found that after administration of ordinary doses of 3 to 4 cc no visible changes were noticeable in the stomach. If, however, larger doses such as 2 to 4 cc per kilo body weight were administered, the mucous membrane of the stomach and upper part of the small intestine becomes red and inflamed.

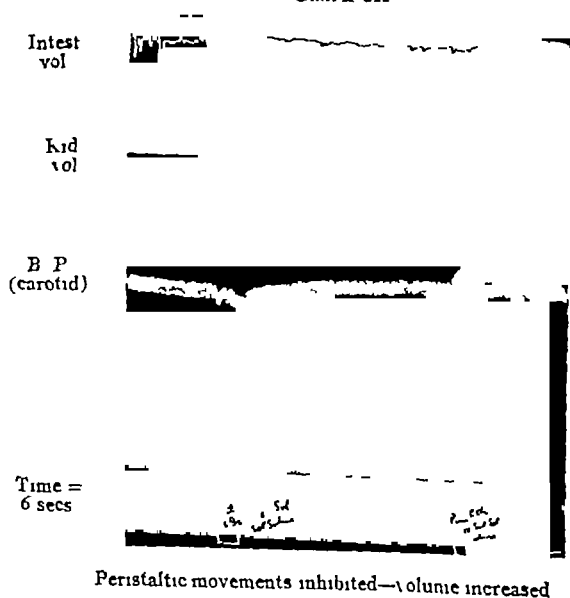
On muscle tissue the drug has a decidedly depressant action. On isolated pieces of intestine of the rabbit suspended in Ringer Locke's solution, dilutions of 1 in 120,000 had the effect of inhibiting peristaltic movements.

40,000 carbon tetrachloride on a contracted guinea-pig's uterus

The absorption of the drug from the stomach and intestine is still under investigation. That a certain amount is absorbed is obvious from the fact that such symptoms as dizziness and sleepiness appear about an hour after administration. Most of the drug appears to pass out in the faeces unchanged. The patient has the sensation of being drunk, the extremities feel numb and he is drowsy and goes to bed to sleep it off. These symptoms generally disappear in an hour or two, indicating that the drug is rapidly eliminated, as with the other volatile members of this group. Such small amounts as 1/10th of a cc (0.16 gm) injected directly in the circulation produced toxic effects on the heart and respiration. The amount absorbed into the general circulation, however, can only be very small, as no such effects were observed clinically. Graph III shows the effect of an intravenous injection of 4 cc of a saturated solution of carbon tetrachloride (containing 5 mgms of CCl₄) in normal saline. The movements of the intestine are inhibited at once, and the volume as recorded by an oncometer shows an increase. A second injection of a similar amount inhibited the movements still more and the volume

increased further, owing to the relaxed condition of the muscle fibres and consequent engorgement of the vessels. It is obvious from these experiments that carbon tetrachloride has a depressing effect on the muscular tissue of the intestine.

GRAPH III



RESPIRATORY SYSTEM

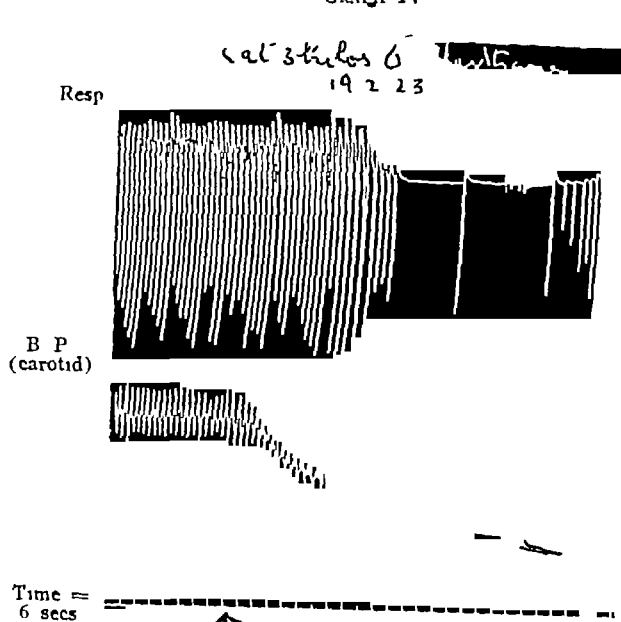
Inhalation of the vapour or actual contact of the liquid drug with the mucous membrane of the respiratory passages has a marked irritant effect. Hall first pointed out that if a gelatine capsule containing carbon tetrachloride accidentally broke in the throat of a dog during the process of administration, the animal immediately collapsed. Respiration became very feeble and the pulse became imperceptible. Animals can be revived with artificial respiration, but if the quantity of the drug gaining access to the larynx and trachea is at all large, the animal dies.

We carried out a number of experiments to find out how this was brought about. In a cat of 2½ kilos under urethane or ether anaesthesia, introduction of 1/20th of a c.c. of carbon tetrachloride into the trachea caused arrest of the respiration, the heart beats became very faint when heard with a stethoscope and the blood pressure fell, the animal however gradually recovered. Injection of 1/10th of a c.c. into the trachea produced similar effects but the animal did not revive (Graph IV) unless vigorous artificial respiration was given. In the dog half a c.c. produced symptoms of collapse but a bigger dose was required to kill.

With chloroform similar results were obtained but much less marked in degree. Our experiments show that the irritant effect of carbon tetrachloride on the mucous membrane of the respiratory tract is much stronger than that of chloroform or of carbon disulphide.

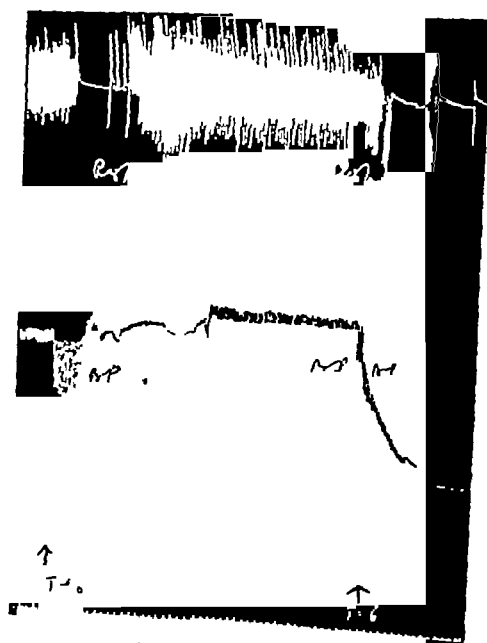
The stoppage of respiration and of the heart was brought about so quickly that it could not be attributed to absorption of the vapour in concentration from the large surface of the lung capillaries, which might produce a direct effect on the heart or centres in the brain.

GRAPH IV

CCl₄ 1 c.c. in trachea

Also if the drug was sprayed into the throat of a cat under anaesthesia with the tracheal

GRAPH V



Female cat—2000 gms

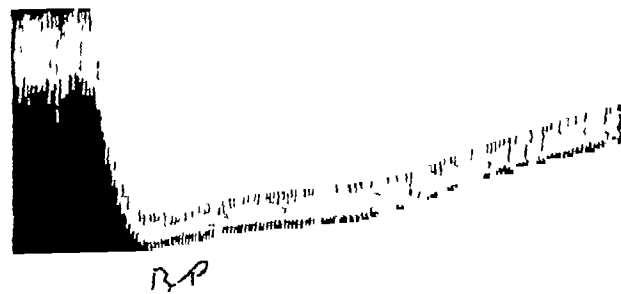
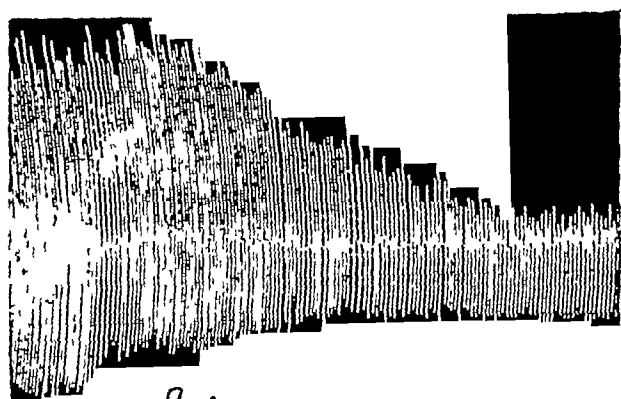
CCl₄ 1 c.c. sprayed on the back of throat—tracheal cannula in position. Acceleration followed by inhibition.

CCl₄ 1 c.c. in tube connecting anaesthetic bottle with tracheal cannula—collapse—death.

cannula in position, so that neither the vapour nor the liquid could penetrate into the lower air passages, the symptoms of collapse were still produced. The heart was stimulated and the amplitude of the beats was exaggerated at first, but soon the beats became imperceptible on the pressure curve, and respiration ceased. Recovery, however, took place and the respiration re-started after a few spasmodic contractions of the diaphragm and became quite regular again (Graph V).

One c.c. of carbon tetrachloride (16 gm) introduced into the tube leading from the anæsthetic bottle to the tracheal cannula also produced symptoms of collapse (Graphs V and VI). When chloroform was used instead of carbon tetrachloride, the effects produced were not so pronounced.

GRAPH VI



9.5

Dose - 8 drops - 1/10th to 1/4th c.c.

T = 6

↑ 1 c.c. CCl₄ - 1/10th to 1/4th c.c.

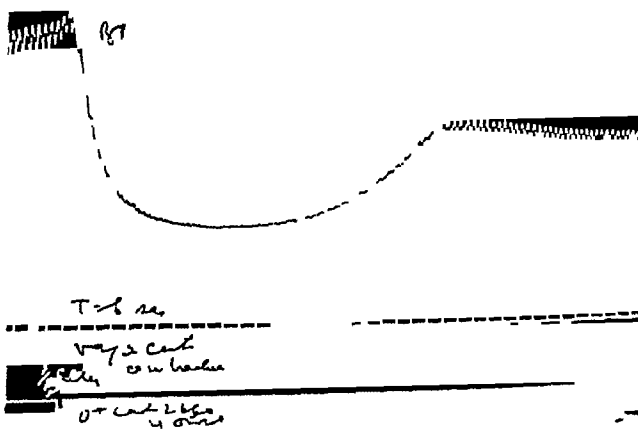
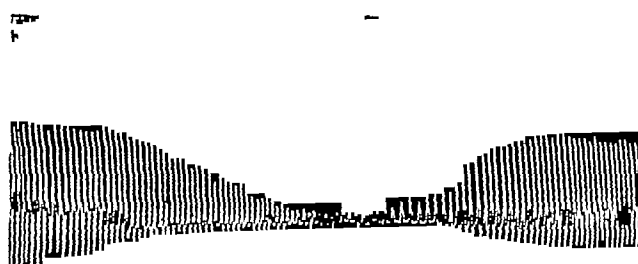
Collapse—recovery

From these experiments it is justifiable to conclude that the collapse produced is a reflex

phenomenon, due to irritation of the sensory nerves of the larynx and trachea, and that possibly the vagi are the chief nerves concerned. To test this we cut both the vagi and found that 1/2 c.c. of carbon tetrachloride injected into the trachea produced a comparatively smaller fall of blood pressure and only a temporary arrest of the respiration, there was no fatal collapse as was the case when the vagi were intact, and to produce death 3 to 4 times the dose was required. We have therefore come to the conclusion that although the main path of afferent impulses is through the vagi, other sensory nerves also take part (Graph VII).

Intravenous injections of 5 c.c. of a saturated solution in normal saline (6 mgms) produced little or no effect on the respiration

GRAPH VII



Collapse—recovery

Larger doses such as 1/10th to 1/4th c.c. (160 to 400 mgms), which owing to the insolubility of the drug in water had to be dissolved in 70 per cent alcohol, when injected very slowly into the femoral vein produced marked depression and irregularity of the heart and respiration. Both may stop altogether. These effects in all probability are due to the direct depressing action of the compound on these organs.

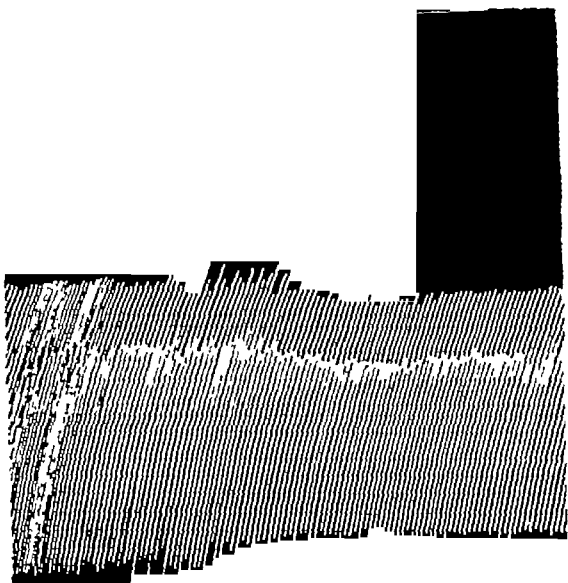
THE CIRCULATORY SYSTEM

On the circulation the inhalation of the drug had a depressant action. If carbon tetrachloride was substituted for ether on a dog under anaesthesia, the blood pressure fell

gradually at first and then suddenly dropped to almost nothing. The animal succumbed in 20 to 30 minutes if the inhalation was continued.

Perfusion of an isolated heart with 1 part of carbon tetrachloride in 12,000 of saline caused depression (Graph VIII). The heart recovers as soon as the perfusing fluid is free from the drug. Weaker dilutions have no

GRAPH VIII



T = 6 sec

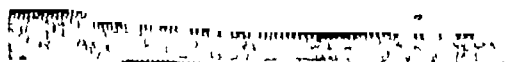
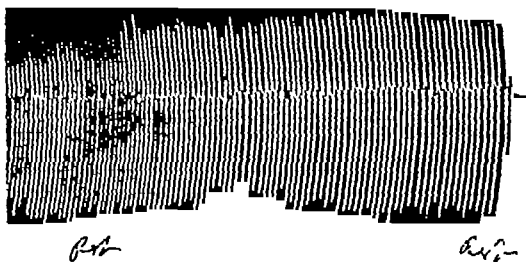
1 cc of CCl₄ in 125000 of saline

Perfused isolated heart—dog
1 in 125000 of CCl₄

effect. The effect of an intravenous injection of 5 cc of a saturated solution of carbon tetrachloride (6 mgms) in saline was to produce a slight initial rise in blood pressure followed by a slight fall. Traces of carbon bisulphide in the drug do not alter this effect in any way. It has already been pointed out that 1/16th to 1/4th of a cc of carbon tetrachloride (100 to 400 mgms) dissolved in 70 per cent alcohol produced intense depressing effects on the heart and respiration when injections were made into the femoral vein. Such doses introduced into the external jugular vein produced even more severely toxic effects, as the drug given by this route reached the heart in higher concentrations. The respirations became shallow immediately after the injection and then ceased, the heart became very feeble, flickered and stopped. Half to one cc of the drug (0.8 to 1.6 gm) in alcohol injected into a mesenteric vein produced little or no effect either on the blood pressure or on the respiration (Graph IX). This remarkable difference

in the effects produced by the introduction of the drug by the portal route as against introduction into the general circulation can only be attributed to its retention in the liver and to the detoxicating properties of this organ. These experiments illustrate in a most lucid manner the protective function of the liver in shielding the vital organs against toxic substances.

GRAPH IX



T = 6 sec

Injection into mesenteric vein

These results are very interesting in view of the clinical observations recorded by Smillie and Pessoa that in persons in whom the liver parenchyma was damaged, as in patients with hepatic cirrhosis, 3 to 4 cc of carbon tetrachloride, which in a normal individual produced no noticeable effects, gave rise to severe symptoms of intoxication. We have no personal experience of such cases, but we have tried the drug clinically in a large number of cases of kala-azar suffering from ankylostomiasis. In some of these cases the liver was enlarged but no untoward symptoms were noticed. We are informed by Major Acton that in this disease it is the inter-lobular connective tissue which is proliferated, and, being outside the firm and non-expandable Glisson's capsule, the parenchyma remains normal even in advanced cases.

GENITO-URINARY SYSTEM

It has been stated that massive doses produce lesions in the liver and kidney. In our experiments on dogs, referred to later on in this paper, doses of 1/2 to 2 cc per kilo produced

no marked changes in these organs. In human subjects cases of hæmaturia have been described after therapeutic doses of carbon tetrachloride, especially if the liver is not functioning properly, but we have not come across this complication. With ordinary therapeutic doses in persons with healthy livers if there is any injury to the liver and kidneys, it must be of a very temporary nature and is soon made good.

On the uterus, carbon tetrachloride in therapeutic doses has little effect. In the pregnant cat, large doses produce no effect. On the isolated uterus of the guinea-pig and rabbit, the effect is undoubtedly depression of activity and relaxation of the uterus if already contracted (Graph II). In ordinary doses, therefore, carbon tetrachloride ought to have no effect on a pregnant human uterus and its administration should be free from risk. Large doses, however, should be avoided, as these might reflexly set up uterine contractions from irritation of the gastro-intestinal tract.

CENTRAL NERVOUS SYSTEM

Hall has described the effects of inhalation of carbon tetrachloride and has divided these into three stages. The first is that of excitement, there being tonic and clonic movements of the muscles with slight initial rise of blood pressure, followed by a fall. The second stage is that of anæsthesia, in which the heart beats quickly, the pulse is feeble and the blood pressure is low, and the third stage is that of collapse. In our experiments on animals we found that the first stage was rather prolonged and in an anæsthetic box it was difficult to get the animal under in less than half an hour and sometimes it took longer. This no doubt is due to the lower volatility and slower rate of diffusion of the drug. The second stage rapidly, almost suddenly, passes into the stage of collapse, showing that the drug has a much smaller margin of safety than other anæsthetics such as chloroform and ether.

The effect of carbon tetrachloride on the central nervous system is slight and shows transient preliminary stimulation, followed by depression.

TOXICITY

The pure drug introduced into the digestive tract even in large quantities is astonishingly safe. Our experiments on the dog, described hereafter, confirm this. Hall has pointed out that only products free from carbon disulphide and phosgene should be employed as mixture with these latter gives rise to toxic effects. We have used clinically and also for some of our animal experiments samples of carbon tetrachloride bought locally and only samples proved free of carbon bisulphide were selected. Traces of other impurities were usually present, but these were apparently harmless.

Monkeys are very tolerant to carbon tetrachloride. Escobar gives as a routine 4 c.c. in human adults with no untoward symptoms except drowsiness and dizziness. Some authorities have given $\frac{1}{2}$ to 4 c.c. per kilo to experimental animals, without giving rise to any pathological changes in the organs, while others have found fatty changes occurring with much smaller doses. The reason for these discrepancies appears to be that regeneration in the liver, the organ chiefly affected, quickly follows on degenerative changes, and secondly, that in apparently normal animals, especially dogs, which have to be used in these experiments owing to their high degree of susceptibility to carbon tetrachloride, patches of fatty degeneration are not an uncommon occurrence. Also it must be remembered that under experimental conditions, when the dogs are kept more or less tied up, only a certain amount of exercise being allowed, and the food being rather better than that which they ordinarily have, a certain amount of fatty infiltration of liver is bound to take place. This, however, can hardly be called a pathological change. The results are therefore liable to be vitiated if these factors are not taken into consideration.

We have carried out a series of experiments on dogs to determine the toxic effects of therapeutic and large doses of carbon tetrachloride on the organs generally and on the liver particularly. The protocol and the results of examination of the organs are briefly given below. We are greatly indebted to Major H. W. Acton, I.M.S., for the preparation and examination of the microscopical sections. This entailed much labour. Sections of material taken from the liver at the preliminary laparotomy were compared with sections taken after death.

Expt I—Dog—Weight 8 kilos. Preliminary laparotomy on the 28th February, 1923. Wound healed and dog in excellent condition on the 23rd March, 1923. 4 c.c. of carbon tetrachloride (64 gms.) in $\frac{1}{2}$ ounce of saturated solution of magnesium sulphate given on two successive days and a third dose given 6 days after. No noticeable symptoms. Dog killed 3 days later. No apparent change could be detected in the organs with the naked eye. Microscopic examination showed slight fatty infiltration in the cells at the periphery of the lobule, which could not be detected in the original section. No changes in any other organ.

Expt II—Dog—Weight 8 kilos. Preliminary operation on the 19th March, 1923. Wound healed and in good condition on the 16th April, 1923. Given 3 doses of carbon tetrachloride, 4 c.c. each, as in dog No. I but without any accompanying or after purgative. The dog showed no symptoms. Killed on the 26th April, 1923. The organs showed no naked eye changes. Microscopic sections of the liver, kidneys, lungs, etc., were examined and found to be free from any pathological changes.

Expt III—Dog—Weighing 7 kilos. Operated on the 19th March, 1923. Wound healed and animal fit on the 16th April, 1923. Put on daily doses of 2 c.c. of carbon tetrachloride (32 gms.) in a small quantity of water till 6 doses were given. No particular symptoms were noticed during the period of administration except

that on two occasions the dog passed blood and mucus. The dog was killed at the end of this period. No naked eye changes were apparent in any of the organs. Microscopically sections of the liver showed slight fatty infiltration not present in the original section.

Expt IV—Dog—Weight 8 kilos. Anæsthetised with morphia and ether. Carbon tetrachloride substituted for ether and inhalation continued till death took place. Total quantity inhaled about two ounces. No microscopic or macroscopic changes found in the lungs or liver.

Expt V—Dog—Weight 11½ kilos. Given 6 doses of carbon tetrachloride of 4 c.c. each (64 gms.) in half an ounce of castor oil. The doses were given during three weeks at the rate of two a week. No symptoms observed during the course of administration. Killed on the 16th May, 1923, four days after the last dose. No naked eye changes found in the organs. Microscopically the liver showed in parts evidence of degeneration of the cells around the central vein. The kidneys and other organs showed no changes.

Expt VI—Dog—Weight 8 kilos. Given two consecutive doses of 8 c.c. of carbon tetrachloride (16 gms. per kilo) with water. These were repeated after 6 days. Killed on the 25th May, 1923, 5 days after the last dose. No naked eye changes in the organs. Microscopically the liver showed fatty infiltration and in parts there was some indication of destruction of the cells. The kidneys showed evidence of cloudy swelling and desquamation of the renal tubules. The other organs showed no change.

Expt VII—Dog—Weight 9.25 kilos. Given 18.5 c.c. of carbon tetrachloride (32 gms. per kilo body weight) in water. The animal showed no signs of dizziness or drowsiness after the dose was given and ate his usual food. Watched for 5 days but no untoward effects observed. Killed on the 26th May, 1923. No naked eye changes apparent in any of the organs. Microscopically there was evidence of early degenerative changes in parts, in the liver. The other organs were quite normal.

Expt VIII—Dog—Weight 10 kilos. Given an extract made by finely pounding 6 *Ascaris lumbricoides* in 10 c.c. of carbon tetrachloride. No symptoms.

Expt IX—Same dog as in the last experiment given 20 c.c. of carbon tetrachloride in water (32 gms. per kilo body weight). Killed on the 9th June, 1923, 24 hours after. No naked eye changes in any organs except that the stomach and the upper part of duodenum were somewhat red and inflamed. Microscopically the liver showed slight inter-lobular infiltration, which is seen in fluke infections in these animals, and some fatty infiltration. No pathological changes in any of the other organs.

Expt X—Dog—Weighting 4.56 kilos. Given 10 c.c. of carbon tetrachloride per kilo body weight daily for 8 days (total 36 c.c.=57.6 gms.). After the third dose the dog passed blood and mucus in the stools, but this disappeared on the following day. Killed two days after the last dose. Macroscopically the stomach looked somewhat congested, the whole of the surface of the mucosa was covered with sticky mucus, the intestines especially the small, were also congested. No changes in any of the other organs. Microscopically no pathological changes in any of the organs except the liver, which showed fatty infiltration of all cells and degeneration of cells at the periphery of the lobules.

Expt XI—Dog—Weighting 8.16 kilos. Given 4 c.c. of carbon tetrachloride per kilo body weight (total 32.6 c.c.=52.16 gms.), in one dose. Showed no untoward symptoms after the dose. Killed three days after. Naked eye examination showed yellowish areas of fatty degeneration in the liver. No changes in any of the other organs. Microscopically the liver showed fatty infiltration in the outer edge of the lobules with karyorrhexis. The cells of the central portion were not affected. All the other organs were normal.

Expt XII—Dog—Weight 9.5 kilos. Given 4 c.c. of carbon tetrachloride per kilo body weight (total

38 c.c.=50.8 gms.), in one dose. Looked slightly drowsy after the dose. Killed 6 days later. Microscopically the liver showed marked fatty infiltration and degeneration at the periphery of the lobules. The other organs were normal.

Expt XIII—Dog—Weight 8.59 kilos. Given 4 c.c. of carbon tetrachloride per kilo body weight (total 34.4 c.c.=50.04 gms.), in one dose. Showed no symptoms after the dose. Killed 20 days after. Macroscopically no change in any of the organs. Microscopically the liver showed definite fatty degeneration and necrosis of cells. All the other organs were normal.

DISCUSSION OF RESULTS

It will be observed that in the first four experiments, laparotomy was performed on the animals before treatment with the drug was started. The liver, being the chief organ implicated, was examined macroscopically and a piece was also removed for microscopic examination. This was done at the suggestion of Major H. W. Acton to exclude the possibility of previous disease and to serve as a control to the experiment. After the administration of the drug the liver as well as the other organs, the stomach, intestine, spleen, kidney and lungs were carefully examined both macroscopically and microscopically.

The drug was given in combination with magnesium sulphate, which does not dissolve it and which hurries its passage through the alimentary canal. It was given with castor oil which dissolves it and fixes it, at any rate during its passage through the stomach, and lastly it was given suspended in water. With the ordinary 4 to 5 c.c. doses it appears to make little difference what vehicle is used, so far as the production of toxic symptoms by the drug is concerned. Theoretically the combination with magnesium sulphate should be more effective as it should convey the drug quickly and in concentration to the habitat of the parasites and should also help mechanically by washing them down. The castor oil combination ought to be less effective as the drug becomes fixed in the oil and its liberation in the duodenum could only be gradual. The use of this oil as a vehicle or as an after purgative is not fraught with any danger as in the case with some of the other anthelmintics. All these facts are supported by our clinical experience.

As regards the toxic effects of the drug on the liver and other organs, the slight fatty changes in Expts I and III cannot, in Major Acton's opinion, be termed pathological. These changes are of a temporary nature, but may become permanent if the drug is continued for long periods. Frequently repeated doses of 0.5 to 1.6 gms. per kilo body weight appear to have a toxic effect on the liver cell (Expts V, VI and X). It has been stated that 10 gm. of the drug per kilo body weight produces fatal results. In experiments VII and IX we gave 32 gms. of carbon tetrachloride per kilo without causing any inconvenience to

the animal. The liver and other organs showed no marked immediate or delayed changes. The patchy degeneration of cells was probably only of a temporary nature. Even with doses of 6.4 gms per kilo (Expts XI, XII and XIII) the animals showed no apparent symptoms of intoxication, but toxic effects were undoubtedly produced in the liver which were still quite marked at the end of 20 days. In none of our experiments did any of the other organs such as the lungs, spleen, stomach or intestines show any pathological changes. The kidney was very carefully watched throughout the whole series of experiments. With the exception of Expt VI—in which cloudy swelling of the cells of the tubules occurred and which was probably accidental—no evidences of any pathological changes were detected in the other animals, even when such big doses as 4 c.c. per kilo body weight were given.

In Expt VIII an extract of round-worms in carbon tetrachloride was given to see if the drug dissolved out any toxin from these parasites and produced the toxic symptoms which have been noticed when it has been administered in hookworm cases complicated by severe ascariasis.

CARBON TETRACHLORIDE AS AN ANTHELMINTIC

In vitro experiments.—We carried out a number of experiments to test the action of different concentrations of carbon tetrachloride *in vitro* on some of the common intestinal parasites. Captain G. Shanks, I.M.S., very kindly sent us a number of living *Necator americanus* obtained from post-mortem material. These were put into solutions of carbon tetrachloride in normal saline of strengths 1 in 1500, 1 in 3000, 1 in 6000 and 1 in 12000. The *Necators* placed in 1 in 1500 solution died in 15 minutes, those in 1 in 3000 in 35 minutes, and those in 1 in 4000 in 70 minutes. These are probably the dilutions in which the drug reaches the habitat of the parasite. In lower concentrations they lived for several hours, as long as the controls in normal saline, although one solitary specimen survived in normal saline for over 20 hours.

On the living segments of the tape-worm the drug has little effect. A segment was dropped into pure carbon tetrachloride. It became curled up, opaque and all movement ceased. After two minutes' immersion it was taken out and washed in normal saline and made a complete recovery. In an emulsion of carbon tetrachloride in normal saline, made by shaking the two together in a test tube and allowing the former to settle for one minute the movements were at first stimulated and then slowed, but at the end of 1½ hours had not ceased.

On *Ascaris lumbricoides* carbon tetrachloride has little or no effect. Even in an emulsion of the drug in normal saline, the parasites remained quite active for hours.

From these experiments it is obvious that clinically the drug is not likely to be of much use in infections with *Ascaris lumbricoides* and tape-worms.

CLINICAL OBSERVATIONS

Our hospital cases were treated with locally bought carbon tetrachloride proved free of carbon bisulphide. We have given this drug in various doses and by various methods to over 230 cases in the Carmichael Hospital. We have given it with water, in capsules, in castor oil as a vehicle, we have given it with and without after-purgation and have used different purges at varying periods after the anthelmintic. It would take too much space to state the results in detail. The best results we have obtained so far are by giving to an adult a dose of 70 minims in water, accompanied by 1 oz. of concentrated solution of magnesium sulphate. This treatment is given on two successive days. The drug is administered about 2½ hours after food and no food is taken until three hours afterwards. The figures we have show that by this method, one treatment on two successive days removes 98.8 per cent of *Necators*, and 87.8 per cent of ankylostomes. It has also a powerful effect on *Oxyuris vermicularis*, but owing to the comparative uselessness of the microscope in diagnosing the presence of this parasite, and the impossibility of certifying a radical cure, we are unable to give figures. The administration of the drug may be followed by mild toxic symptoms. Nausea, culminating in vomiting 1½ to 2½ hours afterwards, giddiness and drowsiness are complained of by about one case in six. If no purge is given these sequelæ occur in about one case in three. We attempted to find clinically if any damage is done to the liver when carbon tetrachloride is given in this way. For this purpose we used the urobilin test and in nine cases Dr J. P. Bose of the School has done a lævulose tolerance test before and after the treatment. By neither test have we obtained any evidence of liver damage. Lamson and McLean used the phenol-tetrachlor-phthalein test as an indication of functional changes in the liver. This dye is normally excreted rapidly, but is retained in the blood if the liver is diseased or injured. In dogs, doses below 4 c.c. per kilo body weight as a rule produced no functional disturbances of either the liver or kidney. Doses of 4 c.c. per kilo produced disturbances of the liver functions lasting for 96 hours, the liver then return to normal.

It happens that we have never given carbon tetrachloride to any patient heavily infected with round-worms. This drug is not an efficient anthelmintic for *Ascaris* and cases of heavy round-worm infection, even when hookworm infection was co-existent, were treated with chenopodium. We are, therefore,

to give any opinion on Lambert's experiences Lambert records two cases of death in children from the use of the drug Both these cases had heavy round-worm infection He also records five other cases of serious illness following on the administration of carbon tetrachloride—illness promptly relieved by the expulsion of ascarids on giving chenopodium or santonium Some deaths among children have been reported from Assam, the patients sinking into coma from 36 to 48 hours after ingestion of the drug and it is possible, of course that these cases may have been similar to Lambert's

We also have had no experience of the drug when given to alcoholic patients but we have given it to a large number of cases of ankylostomiasis complicated with kala-azar before treatment of the latter disease was begun without any clinically perceptible detriment

CONCLUSIONS

1 Carbon tetrachloride is the most efficient anthelmintic known for hookworm It is of little value in *Ascaris* infections and of no value against *Tenia*

2 The toxic dose of 1 to 4 cc per kilo body weight in our experiments is far in excess of the therapeutic total dose of 5 cc, i.e., 0.13 cc per kilo which is given as an anthelmintic to a normal individual weighing 65 kilos

3 Owing to its low solubility and volatility and consequently slow rate of diffusion only small quantities are absorbed into the circulation Large quantities can therefore be introduced into the alimentary canal without untoward effects

4 When given in medicinal doses and with a purge to persons organically sound it is safe provided that the drug is pure and that it is swallowed and does not enter the larynx Carbon tetrachloride itself and its vapour are very irritating and if brought into contact with the mucous membrane of the respiratory tract in any concentration may produce a reflex stoppage of respiration and later a stoppage of the heart and death Therefore it must not be forced on struggling children

5 The great contra-indication is a liver with impaired function such as is caused by alcoholism chronic or acute The liver appears to retain a large proportion of the small quantity which is absorbed and so protects the vital organs from injury The presence of heavy round-worm infection may also be a contra-indication

6 Large and toxic doses of this drug whether single or divided have a damaging effect on the liver parenchyma With therapeutic doses the damage if any, is temporary and unimportant

7 The action of the drug on voluntary and involuntary muscle is depressant. In medicinal doses it is slightly laxative and it has no abortifacient tendencies

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A NOTE ON THE COMPLICATIONS FOLLOWING 1322 CONSECUTIVE CASES OF CATARACT EXTRACTION

By M M CRUICKSHANK, M D, B SC, CAPT, I M S

THESE cases represent a part of the work done by Dr Holland of the C M S Mission Quetta and his staff, during the season at Shikarpur from January 2nd to February 19th, 1923 Other eye operations numbered 882 including 171 optical iridectomies, 73 iridectomies for glaucoma—Holland having given up trephining in favour of iridectomy and considering the latter as effectual and safer than the former, 292 cases of trichiasis were treated by various methods, the superiority of Anagnostakis' operation being demonstrated General surgical operations numbered 357 including 111 cases of hæmorrhoids, 44 cases of vesical calculus, and 19 cases of hernia

Difficulties confront the surgeon on every hand Besides the staff of doctors, which varies during the season from three to five, there are two trained sisters, two very expert cataract assistants, one sub-assistant surgeon one compounder and three trained orderlies Four doolie bearers are engaged on the spot and as they are untrained in the handling of cataract patients they constitute a menace

Time is also a difficulty, as the work cannot be carried on after the middle of February on account of flies and dust. Again, operations cannot be postponed so that cases may be submitted to fuller examination under a mydriatic, such examination must be carried out at once and operation decided for or against, otherwise a condition of chaos would reign within a very few days. There is then a constant bustle, which cannot be excluded even from the operating theatres, of which there are two, and which, undoubtedly, has an influence in producing unfavourable complications.

Cataracts, eyes, orbits, patients and circumstances under which an ophthalmic surgeon may be called upon to operate vary under normal conditions, but in Shikarpur their variety is legion. To pass close on 2,000 cases of cataract through one hospital in the short space of several weeks spells variety.

Perhaps nowhere is glaucoma so prevalent as it is in Sind, out of 7,800 new out-patients, 702, or 9 per cent, were cases of glaucoma.

All phases of glaucomatous cataract are to be seen, by far the largest number of inoperable cases falling into this class, and examples of Smith's twelve clinical classes pass in review almost daily.

Eyes vary chiefly in tension and in cleanliness or the lack of it. When the conjunctival sac is unhealthy, treatment with silver nitrate is carried out for several days prior to operation. Cases of trachoma are treated by various methods, if necessary by combined excision of the tarsal plate, cases of trichiasis by plastic operations, before the major operation is undertaken. Risks, however, in this respect must be taken when dealing with patients who have travelled long distances and who are unwilling to return to their villages untreated. Patients are drawn chiefly from Sind and Baluchistan, but numbers come from the Punjab and the N-W F Province.

The patients themselves present an endless variety of type and temperament. The stalwart immovable Brahui in the out-patient room becomes the most senseless, intractable and stupid being on the operating table. Restive and jumpy, he rolls his eyes in all directions and any attempt to fix the eye results in persistent efforts to squeeze the lids tightly together. One has, if possible, to anticipate his every move, take advantage of momentary calms, and finish the operation with the greatest speed compatible with a successful result. At every step in the operation, and until the bandage has been applied, the danger of vitreous prolapse looms large when the patient is a Brahui. The Brahui for restlessness and the corpulent over-nourished Hindu for nervousness are in marked contrast with the placid Mohammedan, who lies quiet-

ly on the table and remains silent throughout the operation. While there are few, if any, exceptions as to behaviour amongst the Brahuīs, one does find the tranquil, city bred Hindu and the restless village born Mohammedan. As a rule women make better patients than men. This, however, is due to the effect of temperament rather than to sex. A placid and cheerful state of mind is an encouraging sign, and the apathetic fatalistic attitude is not the bad omen which it appears to be in general surgery.

The patient in himself presents sufficient in the way of difficulties during the operation, the conditions under which he has to live and be cared for after operation furnish many more.

From necessity, not choice, the "wards" consist of a series of sarais and brick out-houses, where the patient lives after his own fashion surrounded by his friends and relatives in that condition of want of cleanliness which is the rule in India. One wonders how the percentage of eyes lost on account of sepsis remains at the low figure obtaining, when one sees the filthy state into which the majority of the patients and their friends contrive to bring their immediate surroundings despite conservancy facilities placed at hand.

With regard to the healing of wounds also, the Mohammedan and the Hindu are in marked contrast. The robust virile Mohammedan peasant, accustomed as he is to a hard open air life seems much better able to withstand bacterial infection than the Hindu, who has spent his days in the enervating atmosphere of the bazaars, overfed and under-worked. As a result amongst the peasants wounds heal more quickly, and one sees a greater percentage of quiet eyes on the fifth and seventh days, and while the majority of Mohammedan patients are discharged from hospital from the tenth to the twelfth day, amongst Hindus this is the exception rather than the rule. The latter's mental attitude towards disease is different. He is in a constant fever of anxiety over trivialities of treatment, and when he has exhausted himself on the score of drops and lotions, he will enquire most anxiously as to the quantity and temperature of the milk which he may or may not drink. He cannot comprehend the masterly inactivity that leaves a corneal wound to heal by first intention and of its own accord. Such mental worry is a serious disadvantage to any patient who has to undergo operative treatment.

In the choice of patient also risks must be taken, which under more favourable circumstances would not be incurred. Patients come long distances by train and bullock cart for treatment, and for many it may be that such another journey is out of the question. If really good statistical results were aimed

at, then many cases would be classed as inoperable, which at present are given the benefit of the doubt, and though most of the failures occur amongst these "bad" eyes, yet in many cases excellent results are obtained. If the safe policy were adhered to, and the bad eyes, from an operative point of view, refused treatment, then there would be in Sind now several hundreds of cases still blind, who at present enjoy useful vision.

Most of these cases if turned down would resort to the Indian coucher for relief, a relief which in 95 per cent of cases would be but temporary.

The choice of patient, therefore, is not overstressed that statistics may benefit.

Glaucomatous cases, if inoperable, must be turned away, and here the surgeon must exercise care if disaster is to be avoided. These unfortunate people, knowing that in operation lies their only chance of some degree of vision, wilfully deceive, asserting that they have perception of light and even guessing at finger counts, in an endeavour to influence the surgeon in favour of operation.

To obtain accurate histories is impossible. It is, therefore, not surprising to find that several cases surgically perfect remain without vision. These cases were later submitted to ophthalmoscopic examination and fundus changes, such as retinitis pigmentosa, choroido-retinal atrophy and atrophy of the optic nerve were found, accounting for the bad visual result. The patient anxious for operation is given his only chance, and finding no improvement in his condition, usually accepts his fate very philosophically.

The choice of operation. Though a strong advocate of the intracapsular method, Holland is convinced that it is not necessarily the operation of choice in every case.

To the three classes, juvenile, congenital and secondary cataracts, which Smith considers as unsuitable for the intracapsular operation, Holland adds five more—

1 The "ox eye" type—the very prominent eye found in full blooded plethoric individuals, in whom vitreous prolapse is liable to occur. It is difficult to ascribe a reason for the prolapse in these cases. Routine use of the tonometer, however, might throw some light on this point.

2 Those cases of double cataract in black haired, healthy men of from 35 to 50 years of age, in whom the zonular fibres are still very resistant and require a pressure for their rupture which leads to vitreous loss.

3 Those cases of cataract in glaucoma and of glaucomatous cataract, in which a preliminary iridectomy is advised, the lens being extracted with capsulotomy three weeks to twelve months later, to avoid if possible the

danger of choroidal hæmorrhage. In these cases Holland stresses the point that the incision must be made slowly, the aqueous being allowed to escape slowly and to balloon out the conjunctiva.

4 Cases of traumatic cataract. In these cases prolapse of vitreous is very liable to occur, probably owing to the fact that the trauma has already ruptured the hyaloid membrane and the pressure exerted in extraction in the capsule is therefore more liable to cause vitreous loss.

5 Those cases where ordinary, legitimate pressure fails to dislocate the lens. It is very difficult to persuade one self that the lens which is just refusing to present belongs to this class, and the inexperienced operator is tempted to try that little more pressure which ends in escape of vitreous before the lens presents.

The question then arises, "What are the limits of legitimate pressure?" Granted that the incision is large enough to allow the lens to pass, there are still many factors to be reckoned with, the tensile strength of the zonular fibres, the intraocular pressure, the degree of fluidity of the vitreous and to some extent perhaps the thickness and elasticity of the sclera. Again the method of applying the pressure, the point and direction of the pressure must also be considered. Only a wide and varied experience will enable the operator to decide what technique should be followed in these cases, and when the limit of pressure has been reached and capsulotomy should be performed.

Would there be any advantage in encouraging those lenses to tumble which resist normal pressure and are difficult to dislocate?

Only mouldable cataracts, the intumescent and mature varieties, are suitable for turning. Smith definitely states that those lenses which do not mould much, the immature, the hard mature and the hypermature, are best dislocated at the wound first and brought out in the upright position. The balance of evidence therefore, is against attempting to tumble those lenses which fall into Holland's second and fifth classes. Should the operator endeavour to extract such lenses in the capsule, he should be prepared to further their extraction with the aid of the spoon or spatula.

TABLES GIVING A SUMMARY OF RESULTS

	Total	Cured	Not improved
1 Extracted in the capsule	1,241	1,173	68=5.5 per cent
2 Extracted with capsulotomy	81	73	8=9.9 "
	1,322	1,246	76=5.7 "

REASONS FOR NON-IMPROVEMENTS

No of cases		
Sepsis	24=	18 per cent
Choroidal hæmorrhage	13=	10 "
Choroido-retinal atrophy	4=	03 "
Retinitis pigmentosa	2=	015 "
Optic atrophy	2=	015 "
Corneal opacities	14=	11 "
Couched lenses	6=	045 "
Burst capsules with cortex remaining	4=	03 "
Vitreous loss	3=	028 "
Vitreous loss associated with spoon aided deliveries	2=	015 "
Spoon deliveries	2=	015 "
	76	

COMPLICATIONS

Vitreous loss, with no other complication	76	per cent
" associated with spoon aided delivery	22	"
Vitreous associated with burst capsule	05	"
" spoon aided "	03	"
Spoon deliveries with no vitreous loss	17	"
Burst capsule with no other complication	56	"
Prolapse of iris	30	"

It will be seen from the above tables that the chief causes of non-improvement were sepsis, corneal opacities and choroidal hæmorrhage. Amongst the failures are included six cases of previously couched lenses, three of which were removed later with material benefit to the patient, and three with no benefit.

In considering the complications and non-improvement of cases, one must realize and appreciate the difficulties under which the work is carried out. In low tension eyes sepsis is prone to occur. Low vitality of tissues with slow healing of wounds, the edges of which do not lie in proper apposition give a ready entrance to bacteria, and post-operative treatment in such will have to be carried out under very favourable conditions if sepsis is to be avoided.

In such cases the advisability of making a conjunctival flap and of using a conjunctival suture as Barraquer does or if necessary a corneal suture, is worth considering.

In two cases where eversion of the corneal flap occurred, a corneal suture was put in with excellent results.

In another case, where the wound refused to heal, the corneal flap not being everted, sepsis occurred after 22 days, despite every possible precaution. In this instance the patient did not, as is not infrequently done, remove his bandage to rub an itchy eye or to test his vision.

To compare the incidence of sepsis following the intracapsular and capsulotomy operations may be interesting, but considering the large number done by the former as compared with the latter method, useful deductions are not possible.

Sepsis occurred in 20 out of the 1241 cases operated upon by the intracapsular method

that is in 1.6 per cent, whilst by the capsulotomy method sepsis occurred in 3 out of 81 cases, that is in 3.7 per cent.

Retained cortex and tags of capsule adherent to the lips of the corneal wound constitute grave dangers, the latter acting as a drain along which micro-organisms can gain ready entrance.

VITREOUS LOSS

It is interesting to note that among the non-improved cases there were only two cases of vitreous prolapse associated with spoon deliveries, three cases complicated by vitreous escape alone, two cases of spoon deliveries not associated with vitreous loss.

Though the percentage of vitreous loss is high—10 per cent—the amount lost was considerable in only one or two cases. In most it amounted to very little, following the lens, in which instance it is of little or no significance.

How far the smallest amounts of vitreous loss may affect the visual acuity in after years is one of the many "end result" problems still unsolved. Lister, who critically examined 98 of Smith's cases, concluded that the vision of those cases in which vitreous had prolapsed eventually became much better than could have been expected at the time of their leaving hospital. He pointed out that with vitreous loss there is a greater distortion of the cornea temporarily, and that tension and conditions of circulation and nutrition take longer to become re-established than when vitreous is not lost. Loss of vitreous then, provided that the eye recovers from the immediate dangers of such loss, is not the serious complication which in former days it was considered to be. This is borne out by the results at Shikarpur, only five cases of non-improvement being attributable to vitreous loss.

BURST CAPSULES ASSOCIATED WITH VITREOUS LOSS

Even if unassociated with vitreous prolapse a burst capsule is one of the most serious complications that can attend the intracapsular operation. By the bursting of the capsule the operation does not resolve itself into a simple extraction with capsulotomy, for the posterior lens capsule has been dislocated, and unless the capsule and retained cortex can be removed entire with the capsulotomy forceps, a very dense after-cataract will be the result. Even if the capsule has been removed the difficulty of milking out flocculent cortex without further loss of vitreous will be considerable. In what percentage of cases are good visual results obtained when the operation has been complicated by bursting of the capsule and prolapse of vitreous?

Out of 14 cases so complicated 4 remained unimproved. Of the 10 giving good visual results 4 were spoon aided deliveries.

A percentage of failures amounting to 28.6 per cent points to a rather serious partnership in complications, though the actual percentage of failures due to this complication throughout the series is of course very small amounting to only 0.3 per cent of the total.

THE USE OF THE SPOON

Giffard thinks that if the vitreous begins to prolapse before the lens is out and if no preparation in the way of a conjunctival flap with sutures has been made, then the operation should be stopped, the wound allowed to heal, and the lens removed later by some safer method, preferably by discussion. This seems unnecessary if the method of using the spoon as described by Smith in the extraction of hypermature cataracts can be employed. There is a significant difference between a spoon delivery, where the lens is scooped out with the spoon, and a spoon-aided delivery where the spoon or spatula is placed behind the lens after the fashion of an inclined plane which will take the pressure normally falling on the vitreous, and up which the lens will glide during the extraction. Judicious use of the spoon or spatula will prevent vitreous loss and might be used with benefit in cases of burst capsule.

In 17 per cent of cases the spoon was used successfully to prevent vitreous loss. Vitreous loss associated with spoon or spoon-aided deliveries amounted to 25 per cent, of these cases 0.3 per cent being complicated by burst capsules. Probably had the spoon been used earlier in the operation this percentage would have been lower. Very close records were made of the slightest vitreous loss and though the number of non-improved cases attributable to the use of the spoon is remarkably small, yet it must be used with great care and judgment if the object of its use is the prevention of vitreous escape.

PROLAPSE OF IRIS

Prolapse of the iris is a serious and worrying complication, requiring as it does further operative measures for its treatment. The smallest prolapse is a potential source of danger and a constant source of pain and discomfort. Minute attention to the replacing of the edges of the coloboma all important as it is will not eliminate the trouble. The prolapse occurs after the bandage is applied, probably when the anterior chamber is reforming. Atropine will not prevent it. Barraquer makes a conjunctival flap, inserts a conjunctival suture, and instils eserine on completion of the operation. By so doing he has reduced his iris prolapses to 0.4 per cent. Fisher refers to it as "the principal complication, because it favours everything one does not wish to see, and perhaps glaucoma." Fisher is convinced that the hypodermic injection of cocaine or novocain, introduced by Villard and practised

by Barraquer, is of value, and a hindrance to prolapse of iris, because the prolapse is in all probability due to the patient squeezing his lids after the bandage has been applied, which he cannot do if the orbicularis has been paralysed by novocain. The injection of 2 to 3 minims of a 2 per cent cocaine solution, subconjunctivally at that point on the corneal limbus, where the iridectomy will be done, is of definite value. The patient feels nothing of the iridectomy and is not so apt to blink his eyelids and cause tearing of the iris. It allows of a more deliberate iridectomy being done with no trauma, due to sudden movement of the eye on account of pain. The less the iris is pulled on and the more efficiently it is replaced, operations materially assisted by the injection, the less chance will there be of prolapse. It was not possible to apply the test of statistics to this minor detail in technique. Hess's peripheral iridotomy, though rendering the extraction of the lens a little more difficult, appears a very useful method of preventing iris prolapse, the small button-hole allowing the aqueous to escape without carrying the iris before it as the anterior chamber reforms.

One cannot get away from the difficulty of extracting the lens through a normal pupil, and here Barraquer's erisophake may prove valuable, because, with it this can be done probably more easily than by any other method.

CHOROIDAL HÆMORRHAGE

Perhaps the most striking fact noted with regard to the complications following the extraction of cataract, was the effect which the routine use of the tonometer had on the incidence of choroidal hæmorrhage, only one case occurring after its use became general.

In the treatment of glaucomatous cataract the importance and the necessity of estimating the tension with the tonometer was proved.

At best the fingers serve only as a rough guide and in many instances give quite fallacious ideas as to tension. More especially is this so in the prominent type of eye, where a certain degree of elasticity gives a false sense of normal tension, the tonometer reading ranging from 45 mm to 50 mm of mercury.

During the latter part of the season, and when time allowed of its being done, tension was estimated with the tonometer in every case of cataract, before any operative measure was undertaken.

Cases received in the operating from the out-patient room, without any note as to tension were found to give readings of from 50 mm or more. Cases with a warning note as to tension, sent in for extraction with capsulotomy or for preliminary iridectomy, were on several occasions found to register with the tonometer 100 mm or more, and, unless for the relief of pain, were refused operation.

On the other hand, cases sent in with a "cave tension," were found normal and operated upon in the usual way, i.e., the lens being extracted in the capsule, with good results.

What tonometer readings then, should decide one in favour of extraction capsulotomy, and what for preliminary iridectomy?

Holland advises that extraction with capsulotomy should be done in all cases where the limits of normal tension are exceeded, that is where the tonometer registers more than 42 mm. Where the tension is over 50 mm iridectomy, with extraction three to twelve months later is the operation of choice, the time interval depending on how far the iridectomy has checked the progress of the glaucoma, perception of light and the pupillary reaction being taken as the indications that the retina is in a condition to admit of hopes of vision.

Any case with a tension of over 70 mm should be regarded as inoperable, as also should any case, where with an opaque lens there is no perception of light. In the first instance choroidal hæmorrhage would be the almost inevitable result, and in the second no benefit can accrue, on account of secondary atrophy of the optic nerve and degeneration of the retina.

CASES

The following five are chosen from a number of such cases to demonstrate the value of tonometry.

In comparing cases Nos 2 and 3, the question might be asked "Does a lens which is extruded unaided point to a degeneration of the zonular fibres occurring *pari passu* with degeneration of the retina?"

- 1 Tension with fingers plus 1 For extraction with capsulotomy
Case presented none of the classical signs of glaucoma
Pupil active Lens white. Tension = 70 mm
Extraction with capsulotomy
Result—choroidal hæmorrhage, evisceration later
This was the only case of choroidal hæmorrhage which occurred after the routine use of the tonometer
- 2 Tension with fingers plus 1 For extraction with capsulotomy
Pupil active Tension = 50 mm
Extraction with capsulotomy
Result—good
- 3 Tension with fingers plus 1 For extraction with capsulotomy
Pupil active Tension = 50 mm
After the iridectomy the lens slowly extruded unaided
Result—not improved
- 4 Tension with fingers plus 1 For extraction with capsulotomy
Pupil active Tension = 30 mm
Extraction in the capsule
Result—good
- 5 Tension with fingers plus 2 ? more. For preliminary iridectomy
Patient states that he has perception of light.

Pupils very sluggish to light. Lens of sea green hue. Projection bad
Tension = 98 mm
Refused operation

An interesting feature of the work this year at Shikarpur was the trial given to Barraquer's operation by Dr W. A. Fisher of Chicago, who operated upon 18 cases by the Barraquer method, which goes by the name of phacoeresis, a process of total extraction of the lens by means of a cupping glass or cannula known as the erisophake, in which, by means of an electric motor or, if electric power is not available, by means of a hand pump specially designed for the purpose, a vibratory vacuum is produced, which ruptures the fibres of the zonula, without exerting undue pressure, allowing the lens to be removed from the eye with ease. Numerous technical details have to be attended to, the preparation of the patient alone taking over an hour, a mydriatic and adrenalin being used. An iridectomy or Hess's peripheral iridotomy may be done, if the latter then the lens is taken out by its lower edge, that is, tumbled. The intensity of the vacuum should be about 60 mm of mercury, but varies according to the degree of elasticity of the crystalline lens to the degree of maturity of the cataract and these conditions vary with the age of the patient. Practice and experience alone will enable the operator to determine the degree of vacuum to be employed in each case.

If the intensity of the vacuum is inadequate the zonular fibres do not break, if excessive, rupture of the capsule may take place. The most delicate point in the operation is the moment when the vacuum is created in the erisophake by pressure on the button of the cannula. Apposition of the cupping glass to the lens surface must be such that when the vacuum is made no leak occurs, the air becoming rarefied and the small cup adhering to the surface of the lens by its rim. If a vacuum does not result almost instantly, the prolonged vibration due to the air being sucked into the erisophake at one point will cause rupture of the zonular fibres with grave danger of losing the lens. If this should happen the erisophake should be removed from the eye and the operation completed by Smith's method, the spoon probably being required to support the lens.

The toilet in cases of simple extraction reduces itself in Barraquer's hands to the application of a 0.5 per cent eserine ointment, as he believes that miosis prevents embedding of the iris in the wound. In cases of combined extraction he merely strokes the edges of the coloboma away from the wound, making sure that they are in proper position. The palpebral fissure is then covered with sublimated vaseline 1—3,000 or yellow ointment, and a gauze shield applied.

Of the 18 cases operated upon 15 were attended with no complication, the visual results being very good. In three cases the capsules burst as the lenses came out, no complications arising. In one case in which the capsule burst no useful vision resulted. Unfortunately the pneumatic vibratory machine went out of order and the method had to be discontinued. Barraquer in his first 1,000 cases, disregarding the first group of patients whose cases served to determine the technique to be followed, had a really remarkable series of results, with a very low percentage of complications. His published results show good visual results in 70 per cent of cases, with —

Hernias of hyaloid membrane	0.7 per cent
Burst capsules	0.4 "
Prolapsed iris	0.4 "
Luxation of the lens	0.3 "

It is essentially a method for a well equipped ophthalmic operating theatre, where time is not of such consequence as it is at Shikarpur, and where someone is at hand to deal with the little troubles which tend to arise in the machine. The setting of the little suction cup accurately on the lens, without getting it caught in the iris, requires reflected light, it being almost impossible to do this with ordinary daylight. While the erisophake suppresses the pressure put on the vitreous—the objection to the intracapsular operation—the Barraquer operation will have to be taken up and practised for a long time under suitable conditions before one can speak of the definite advantages of this over other methods.

Reviewing the work done at Shikarpur numerous problems present themselves for elucidation, some of which have been touched upon, many more still remain for close study, to mention but one, the boat-shaped pupil which too frequently follows the extraction of the lens in its capsule, and which cannot be dismissed merely as the result of faulty technique or of a hasty or careless toilet of the wound.

Were one asked to specify the most important lesson which the work at Shikarpur this year has taught, one would have little hesitation in saying that it was the necessity for the routine use of the tonometer in estimating intraocular tension in cases of cataract.

A PRELIMINARY NOTE ON THE RADIUM TREATMENT OF NEW GROWTHS WITHOUT THE DIRECT APPLICATION OF RADIUM

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In my paper on certain cases of malignant disease treated with radium, published in the

Indian Medical Gazette of September 1918, I noted that the great aim of treatment is not only to eradicate such growth as can be got at, but all other growths too. I noted in that paper both my own observation and those of Clifford Morson (*Proceedings of Royal Society of Medicine* 1914, Volume VII, pages 97-108), that in certain cases when a malignant growth is treated with radium, it is observed that co-existing growths to which radium is not applied appear to be affected and to diminish or disappear. In regard to this Morson says "it is possible that the absorption of degenerated and degenerating cancer cells at the primary site due to exposure to the gamma rays, leads to the formation of some substance which not only retards the growth of the malignant cell at a distance but also stimulates the connective tissue cells to proliferate," and in my paper of 1918 based on similar observations made independently in 1913-14, and subsequently, I suggested that the circulation in the blood of the absorbed elements of breaking down cancer cells (radium disintegration products) may interfere with cancer growth generally in the body.

Now there is in my mind no doubt of the fact that it does occasionally occur that tissues of tumours not directly radiated and at a distance from those actually radiated do suffer and disappear when radium is applied. It has been said that these are radiation effects (G. L. Rohdenburgh and F. D. Bullock, *New York Journal of Cancer Research*, III, pages 181-191, April, 1918), but there is the law of inverse squares to be considered and the distance from the right side of the chest to the position of vaccination scars on the left upper arm is so great as compared with the 0.10 millimeter or less of distance from the radium tube to the keloid where it was applied without screening other than the metal of the tube, that to my mind this excludes the distant effect in a case of keloid as reported by myself in 1918, to say nothing of the fact that I then used only ten milligrams in all of radium bromide. And in any case one would suppose that if it were a distant effect the rate of effect would vary with the distance from the source of radiation. Yet the keloids in the arm subsided along with the keloid on the chest-wall.

In my case of mammary cancer (paper of 1918, *Indian Medical Gazette*) there was a fungating ulcer in the left breast, and up in the axilla was a growth obviously secondary, yet this disappeared, although it was a good six inches away from the margin of the ulcer where the radium was applied, and as to distant effects of radiation we had at that time only two platinum tubes of 0.5 millimeter wall-thickness containing each only 5 milligrams of radium bromide and these were buried in the edges of the ulcer in the breast, not always at the edge nearest the axillary growth but were moved from time to time all round the edge of the ulcer.

It would make this paper too long to quote details of other cases in which similar

observations have been made. Others besides Morson and myself have observed these same curious phenomena, but the observations of all of us put together have not been many. This I think not surprising but an observation that is a positive one is a record of fact, which when observed by more persons than one, will take no mere denial and at least merits an attempt at explanation.

As arising from the foregoing I have hypothesized a position for myself governed by the following postulates—

(1) Whether neoplasms be due to a parasite as yet undiscovered or whether the tumour cell itself constitutes the parasite, we have to deal with a living virus, living in each tumour cell.

(2) If so, is that virus the same for all neoplasms in the same genus or animal?

(3) Whether that be so or not, in every individual suffering from a neoplasm, the neoplasm is nourished by the production of a special pabulum derived from the tissues of the host.

(4) If so, does radiation when lethal to tumour growth act wholly on the cell protoplasm of the tumour cells or does it not also act on the tissues of the host and his tissue fluids where these are within range of the radiation—altering the constituents of the tissue fluids which are being carried in the circulation to the tumour, and if so, is it not probable that the neoplasm cells may find these altered fluids unsuitable for their growth, and that part of the resolving action of radiation on growths is due to this action on tissue fluids, however small this particular influence may appear to be in evidence in any particular instance.

(5) If so, some of these altered fluids passing away in the circulation may reach growths distant from those being irradiated and may similarly influence their growth.

(6) If so, may it not be that it is a question of sufficient dosage, and that remote neoplasms are so seldom influenced because these altered fluids may so seldom reach them in amounts sufficient to produce appreciable effect? It also seems to point to the conclusion that dosage with such fluids must be a potent check on neoplastic growth, for in any case, only a very small amount could possibly reach any metastasis from any superficial focus of irradiation and the wonder is that any such results ever appear in any degree at all. But that they have actually appeared I have no doubt whatever in my own experience.

Of course the whole of these six postulates are purely hypothetical but they are interdependent. We can predicate nothing of the nature of the alteration in these tissue fluids that I have postulated. If there is any truth in these assumptions, it can only be found by putting the matter to a test in which actual irradiation of the growth itself plays no part.

The problem is to provide sufficient irradiated pabulum to check growth and destroy growth of tumour cells. It is at present impossible to

formulate dosage but as the pabulum absorbed is a living pabulum it must be provided as near as possible in this form. Sterilization is not practicable as it would probably destroy living elements or ferments if there be any. The injection of tumour juices would rule out a very large number of cases coming for treatment, and in any case, as pabulum is abstracted from the blood and lymph, I selected the blood to work on and devised the technique adopted as set forth below.

The adoption of this line of treatment would seem equivalent to an attempt to reach tumour cells all over the body and its success would seem to depend almost entirely on sufficient dosage and sufficient irradiation and not too much irradiation of the injected material.

I succeeded some time ago in securing a small pony measuring $9\frac{1}{2}$ hands, suffering from what appeared to be an epithelioma of the glans penis. The animal had suffered from this condition for seven months and it was steadily but slowly growing worse. The organ could not be ensheathed and the glans was covered with an ulcerated cauliflower growth on it and was about $3\frac{1}{2}$ inches in diameter at its largest part. A piece of tissue sufficient for microscopical examination was removed from the glans and placed in rectified spirit. On Saturday, the 25th of November, I removed 20 c.c. of blood from the saphena vein. The barrel of the syringe was wrapped round with a rubber plaster with 500 milligrams of radium bromide in 0.5 millimeter silver containers and 10 milligrams of radium bromide in 0.5 millimeter platinum tubes and the whole syringe placed in a warm chamber for an hour. At the end of this time the contents of the syringe were well shaken up, the solid portion of clot removed and the liquid residue—about 5 c.c.—injected subcutaneously into the animal's neck. No systemic disturbance of any kind followed, and by the 5th of December it was noticed that the growth in the glans had very appreciably diminished, but the organ could not yet be ensheathed.

On the 15th December a second injection was administered, but on this occasion 15 c.c. of blood were drawn into the syringe into 3 c.c. of sterile 10 per cent citrate of soda solution.

This mixture irradiated as before remained fluid at the end of the hour and was injected into the neck as before. After this injection the decrease in the growth was fairly rapid and within a week the penis was readily ensheathed at will and the animal is now well and feeds freely and I have secured him to keep him under observation. The penis shows scars in the area from which the growth has disappeared, but the organ is otherwise practically normal except for some very small remains of ulceration and warty remains of the growth.

There was no local treatment applied to the animal's penis beyond charcoal dressing when he first came to us to reduce the foulness of the

local condition and subsequent washing with a boric lotion or with a weak solution of potassium permanganate, and the condition failed to respond until after the injection of irradiated blood.

Of the tissue excised a portion was sent to Capt Shanks, F.R.S., who has very kindly sent me sections of it stained with hæmatoxylin and eosin. The main features are (1) the deep layers of epithelium dip very deep down, sending in sub-dividing processes far into the underlying connective tissue. (2) The limiting layer of cells between this epithelium and the underlying connective tissue is in some processes intact and in others appears to be broken through by the proliferation of the epithelium which in all the processes shows increase of nuclei at the deep ends. (3) Cells indistinguishable from the epithelial cells at the deeper parts of the epithelial processes and distinct from the connective tissue nuclei of the underlying connective tissue are to be found in considerable numbers close to the deep processes of epithelium and in smaller numbers in the connective tissue at some little distance from the epithelial processes. This condition appears to me to be very suggestive of a basal-celled epithelioma but the detail of the histological picture is not as clear as one would like,—possibly the portion of tissue so far examined represents an area on the edge of the more definitely characteristic part of the growth. The very remarkable feature of this experience however is that the growth, which was so large as to prevent ensheathing of the penis has so rapidly disappeared without any direct application of radium but only on the injection of irradiated blood into a part as distant from the penis as the animal's neck. The neck was chosen as the site for injection so that the animal could not bite at it or otherwise readily interfere with it. There was however, not the slightest systemic or local disturbance and to-day (January 28th 1923) the animal is free from all trouble and is picking up condition. It is too early as yet to draw precise conclusions from this experience, but it is to say the least of it a very remarkable one, and I publish it for what it is worth, and as a record of work which is the outcome of the suggestions I put forward in 1918. I am carrying on further work on similar lines and hope soon to publish further details on the application of this method to malignant disease in the human subject.

Since the above was written in January 1923, the following further details have come under observation and I give them now (June 15th, 1923) —

1 The pony is still alive. In the latter part of March 1923, I became suspicious of the condition of the penis and, although it had been arranged to make him over to a friend to use as a child's pony, I had to finally withdraw my offer in the end of April as I was of the

opinion that the growth was recurring. It is now clear (June 15th, 1923) that there is a recurrence and we are waiting for cooler weather and more settled conditions of work to renew the injections. Meanwhile the facts speak for themselves as far as we have gone with this case.

2 On December 5th, 1923, a patient, No 81 was admitted with a large carcinomatous ulcer involving the whole of the right cheek and associated with a great deal of buccal inflammation and radium was applied on the 7th December, 536 radium element hours, and on the 20th, 482 radium element hours. By the 1st of January there was no improvement, but there were four small perforations which had been threatening when he first came under observation. On the 20th January he was injected in the flanks with $7\frac{1}{2}$ c.c. of his own irradiated blood in 3 c.c. of 10 per cent citrate solution. On 23rd January, 1923, it was noted that the inside of the mouth "had cleared remarkably," only a small red raw surface being left on the inside of the cheek. Owing to the stiffness of the jaw a biopsy was a very difficult matter. The discharge from the perforations, however, continued foul, and the patient was of no help to us in the matter of keeping his mouth clean. On the 5th February he was given a second injection of 20 c.c. of blood in 3 c.c. of citrate solution irradiated for 25 minutes with 500 milligrams of radium bromide. On the 10th it was noted that the whole condition was now apparently checked. There had been no extension of the growth, which had apparently ceased to progress and was clearing up, and there was less discharge. At this juncture the patient left for home against all advice, and I have not heard of him since. This may be summed up as a case in which the growth was apparently clearly checked, but it is a very inconclusive one as there was so much suppuration to obscure the issue, and as the patient left when he did.

3 A patient, No 89, was admitted on the 1st January, 1923, with masses of enlarged glands filling both posterior triangles and the upper parts of both anterior triangles in the neck. The right half of the tongue was paralysed. At its base on the right was a swelling obviously a new growth, extending downwards and outwards, and behind it an ulcer about $\frac{1}{4}$ in \times $\frac{1}{2}$ in reaching on to the fauces. There was a great deal of foul purulent bloody discharge constantly dribbling from the mouth, and the patient was scarcely able to swallow even liquid food, while swallowing solid food was out of the question. It was obviously dangerous to irradiate such a case, as the ulcer in the fauces had already recently bled very profusely, breathing was stertorous and there was hardly any voice. On 4th January, 1923, the patient was injected with 5 c.c. of blood in

3 c.c. of citrate solution irradiated at 99° to 100°F for one hour with 540 milligrams of radium bromide. The next morning he seemed already better and had slept well after many sleepless nights. The character of the discharge from the ulcer in the mouth was much improved. His condition varied a little for the next few days but by the 16th he was able to eat *dāl* (lentil) and rice and swallow it comfortably. The second injection was given on the 19th January and on the 21st the case note is to the effect that all swelling was going down nicely, his general condition was much improved and the growth in the tongue was smaller and the ulcer on it quite healed. After this progress appeared to be slow and a third injection was given on 3rd February 1923. A few days later he developed a slight oedema under the jaw and the voice seemed a little hoarse and radium was applied 225 milligrams on the left, and 315 on the right side of the neck (screen 0.5 mm silver and 1 mm brass and 2 mm rubber and $\frac{1}{2}$ in. of cotton) for 5½ hours, equivalent to 1589.92 milligram hours of element. The injection was repeated on 15th February, 1923, and on 22nd February, 1923 he had an external application of 540 milligrams of radium bromide for 3.3 hours. In the interval between this date and the last injection on the 15th February 1923, the patient had developed a good deal of pain in the neck and in some degree the difficulty of swallowing had returned, but he could still eat *dāl* and rice. However, he now became impatient and abandoned treatment, and I have not been able to find further trace of him.

4. On 5th January, 1923, a patient who had been treated very successfully in June 1922 for carcinoma of the cervix uteri returned with a recurrence in the rectum. This was treated with local application of 200 milligrams of radium bromide, but it seemed to have no effect in checking the growth or the great pain and discomfort. On 2nd February she was given an injection of 20 c.c. of blood in 3 c.c. of citrate solution irradiated for half an hour with 490 milligrams of radium bromide at a temperature of 99° to 100°.

The next day there was immediate relief from pain. The injection was repeated on 17th, 27th February and on 3rd March. The net result was that the patient was definitely relieved after each injection but the pain returned later. As to the growth in the rectum it certainly seemed smaller and the patient volunteered the statement that she was considerably relieved in respect of the sense of weight and bearing down in the perineum, but there had obviously not been time enough to establish very much more in the way of improvement. At this stage her husband declared that it was not possible for him to stay longer in Ranchi and abandoned treatment.

These cases appear inconclusive as to the

net final result that we have been able to record, but they all showed a definite subsidence and checking of the neoplastic growth, even if only temporary as in the case of the pony and in Case No. 3. Cases No. 2 and No. 4 were very unsatisfactory because of the way the people abandoned treatment, and Case No. 3 was even worse in this respect. It is altogether too soon to offer any conclusions on this work but it is just as well to record the bare facts for the present.

5. Case No. 147, admitted on May 8th, 1923, for treatment of a scirrhus carcinomatous growth in the right lower quadrant of the right breast has received four applications of 250 milligrams of radium bromide of 24 hours duration. A large secondary growth under the pectoral fold of the right axilla has disappeared without any application to it of radium, and this is at least four inches from the position of the radium application. I would record this in continuation of similar records made in 1918.

In conclusion my thanks are due to Capt. Shanks for the sections and to my assistant, Assistant Surgeon Bimalkumar Roy, and to the Veterinary Assistant, Mr. M. A. Nadam for their help and co-operation.

NOTES ON SOME CASES OF FRAMBÆSIA

By MAJOR R. KNOWLES, I.M.S., MAJOR R. N. CHOPRA, I.M.S., ASST. SURGEON J. C. GUPTA, M.B., (Cal.), and SUB-ASST. SURGEON B. M. DAS GUPTA
From —The Calcutta School of Tropical Medicine

FRAMBÆSIA tropica is now becoming a disease of some importance in Assam. How the disease entered Assam it is difficult at this stage of time to say. Powell (1923) claims that the infection was imported with infected tea garden labourers from Ceylon. Ramsay and others hold that the infection in Assam probably represents an extension from Malaya and Burma. During a visit of two of the writers to the annual meeting of the Assam Branch of the British Medical Association in January 1923 the subject came up for discussion and through the kindness of Dr. G. C. Ramsay, O.B.E., Labac Central Hospital, Dewan Cachar, twelve cases of the disease were collected and sent at the end of January 1923 to the Calcutta School of Tropical Medicine for study and treatment. We desire here to record our gratitude to Dr. Ramsay for the very considerable trouble taken and for so kindly providing such admirable clinical material for study.

The twelve patients who were admitted to hospital on the 28th January 1923, were all Kuki villagers from the village of Lakhipur Kutchai in the Cachar Hills. They stated that the total population of the village numbers some 100 souls, of whom at least one-third

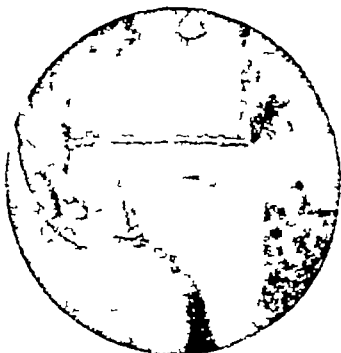
CASE No 1
Before
Treatment
6 2 1923



CASE No 1
After
Treatment
7 3 1923
Sulfarsenol
hypo
dermically



CASE No 5
Before
Treatment



CASE No 5
After
Treatment
7 3-1923
Silver
Salvarsan
hypo
dermically



CASE No 8
Before
Treatment
16 2 1923



CASE No 8
After
Treatment.
7 3 1923
Silver
Salvarsan
intravenously



CASE No 10
Before
Treatment



CASE No 10
After
Treatment.
7-3-1923
Silver
Salvarsan
intravenously



are infected with yaws. Full particulars of the cases are given in the attached table, and we need here only draw attention to certain points of interest. Incidentally it may be mentioned that the table shews the routine methods of examination of all in-patients at the School and the value of such routine examinations in bringing to light secondary infections and in indicating subsidiary lines of treatment.

In examining each lesion not less than four frequently six or seven films were examined,—the first three always by dark ground illumination, the others when stained either by Fontana's or by Giemsa's stain. Only one of the twelve cases—No. 3—could be regarded as in any way severe, and the duration of the disease varied in different cases from 2 to 5 years. In two cases no spirochaetes could be found—No. 1, a case of 5 years duration with button-like ulcers on the soles of the feet, and No. 8, a case of 6 years duration with old standing lesions on the soles of both feet and scaly lesions on the right knee. In the other ten cases *Spironema pertenuis* was found by dark ground examination,—in most cases in abundance. Twenty-five examinations from 20 lesions from these ten cases before treatment was started yielded 22 positive and 3 negative findings. These results should be compared with the results of the Wassermann tests, which were very kindly carried out by Major R. B. Lloyd, I.M.S., Imperial Serologist—5 positive, 4 incompletely negative, 3 negative. The search for *S. pertenuis* by dark ground examination appears to be a far more reliable diagnostic procedure than the serological test.

In examining the granulomatous lesions of yaws we found the capillary pipette method to be useless. *S. pertenuis* seems to be a more superficial organism than is *S. pallida*. The examination of the surface of the lesions, however, often leads to negative findings. The best technique is that advocated by Ashburn and Craig (1907), and is as follows. The surface of the sore is cleansed with a cotton wool swab soaked in warm water and then allowed to dry. The lesion is now gently scraped with the blunt end of a glass slide. If any bleeding occurs it must be checked by pressure. The final exudate is serum only, which is usually found under dark ground examination to be rich in actively motile *S. pertenuis*, 4 to 5 per field. Dark ground examination gave a far better percentage of positive findings than did examination of stained films. With regard to the latter films intended for staining by Fontana's method should be fixed by methyl alcohol, before the mordant is used. The results are far better and the spirochaetes more easy to find after such preliminary fixation.

As seen under dark ground illumination *S. pertenuis* seems a somewhat more flexible

organism than is *S. pallida*. Lateral bending is frequently seen and multiplication undoubtedly occurs by transverse fission. We have once seen transverse binary fission occur under dark ground examination. The time taken for complete severance was about half an hour. Y forms were frequently seen and also the ring forms, described by Ashburn and Craig (1907), where a long individual bends round so that the two ends come into contact.

On the 6th February, 1923, three series of cultures were put up. The material used for inoculation was serum from a granulomatous lesion on the right foot of Case 7, a lesion on the left leg of Case 2, and a lesion on the right thigh of Case 3. The fresh serum films in all three cases shewed numerous actively motile *S. pertenuis* on dark ground examination. Six tubes of Noguchi medium and six tubes of Row's hæmoglobin saline medium with a piece of rabbit kidney in each were inoculated. Unfortunately no growth occurred. Ashburn and Craig's method of taking the spirochaete-laden serum into capillary tubes, which are then sealed and incubated at room temperature was also tried on all three cases, but so far from growth occurring, only dead spirochaetes were found at the end of 24 hours. The reason for the failure was possibly the long duration of the cases, from 4 to 5 years.

Attempts at transmission of the disease to animals were also unfortunately negative. On the 1st February, 1923, four adult *Macacus rhesus* monkeys were taken and inoculated. Material was obtained from the following lesions—Case 9, lesion on the right knee, Case 2, lesion on left elbow, Case 7, lesion on the sole of the right foot and Case 5 condyloma of the buttock. The serous exudate from all four lesions shewed numerous motile *S. pertenuis* on dark ground examination and this exudate was rubbed into from 4 to 6 scarified patches on the shaved abdomen of each monkey with a vaccination lancet. Small pieces of tissue were excised from each lesion and inserted into small pockets in both eyebrows of the monkeys. Each monkey represented an attempt to pass the virus from a different patient. Unfortunately the results were negative—the abdominal lesions at once healed up. Two of the monkeys developed eyebrow nodules which were clinically very like yaws,—in one instance covered with scaly crusts, but although they were repeatedly examined during the next three months no *S. pertenuis* was ever discovered.

On the 3rd February, 1923, four adult male Belgian hares were taken and material obtained from a condyloma on the vulva and a granulomatous lesion on the right thigh of Case 3, the most severe case of the twelve. The fresh exudate from both lesions was demonstrated under dark ground illumination to be full of motile *S. pertenuis*, and was used for inocula-

Case number	Name	Age	Notes
1	Hriangter	36	infected cornea of both eyes of A fragment of tissue from the vulva was finely minced with saline, and 1 cc of this was injected into each testis of all four of these attempts succeeded. His healed up, and no nodules in testes. The testis of one examined four weeks later and most fresh films from minced examined under the dark. Spirochaetes could be detected on account for these failures. In virus from four patients were inoculated into the rined but all with negative results. The species of animals used or the virus in the patients.
2	Huile	35	
3	Chongtai	22	ings.—These are shewn in e typical of such findings in Four were carriers of <i>E. histolytica</i> others shewed Charcot Ley- the stools. All shewed heavy ation, and one of them infected with <i>Shistosoma sinensis</i> . The only febrile p 3, and the fever was here remitted, and not affected by cinchona. Her temperature came to normal.
4	Chunei		days rest in bed. Yet no less than 11 of the 12 patients shewed malarial infection—all three parasites being concerned but infection predominating,—7 cases out of 11. Several of the films shewed numerous gametocytes of <i>P. malariae</i> . In three patients scanty ring forms,—of <i>P. vivax</i> in one and of <i>P. falciparum</i> in two others,—were found in blood films taken from non-febrile patients. In fact most if not all, of the patients were malarial carriers in whom infection was present, but had become latent owing to acquired tolerance.
5			
6			

Five of the patients, Nos 2, 8, 10, 11 and 12 had enlarged spleens and in these patients spleen puncture was carried out. The first drop of fluid from the syringe was used for dark ground examination the second drop for a film stained by Giemsa's stain, and the residue inoculated into tubes of N N N medium. No spirochaetes could be found in any of the films despite prolonged search. No *L. donovani* was found, and the N N N cultures remained sterile and negative. Malarial pigment was a prominent feature in several of the films.

Treatment.—Sulfarsenol and silver salvarsan were used in treatment. The doses and methods of administration were as shewn in the table. During the course of treatment three cases,—Nos 4, 9 and 11,—shewed *S. per- tennue* still present in the lesions after the first injection, and the severe case—No 3—still shewed *S. per- tennue* after two hypodermic

injections of sulfarsenol. On the other hand Case 6 shewed no spirochaetes after the first intravenous injection of silver salvarsan. At the end of treatment all 12 patients were re-examined, films from 13 lesions being searched. In only one instance,—Case 4,—could *S. per- tennue* be found, and he was given a further injection. With regard to the two drugs and to methods of administration we may conclude —

1 That the degree of efficacy of the two drugs in curing the disease is about equal, one to three injections in doses as shewn in the table being necessary to cure the lesions and to render them spirochaete-free.

2 Sulfarsenol has the advantage of being cheaper, and, as it can be given subcutaneously, it is easier to administer.

3 Intramuscular injections of sulfarsenol were tried in two cases, but were found to be very painful and were therefore abandoned.

4 Sulfarsenol is equally efficacious whether given by the intravenous or by the subcutaneous route.

5 Intravenous injections of silver salvarsan do not produce any bigger fall of systolic blood pressure than do intravenous injections of sulfarsenol. There is no fall of blood pressure after subcutaneous injections of sulfarsenol.

The eight photographs shewn in the plate illustrate four of the cases before and after treatment.

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HOOKWORM INFECTION IN THE COAL MINES OF BENGAL

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NINETY-FIVE per cent of the coal mines in the Province of Bengal lie within the Asansol Mining Settlement, the area of jurisdiction of the Asansol Mines Board of Health.

The Asansol Mining Settlement is situated in the western two-thirds of the sub-division of Asansol in the District of Burdwan—the most western sub-division in Bengal—and is bounded on the north by the river Adjoy, on the south by the river Damoodar, on the west by the river Barakar and on the east is continuous with the remainder of the sub-division.

The settlement is 413 square miles in area being roughly 30 miles long by 14 miles broad and includes 202 collieries, 491 villages and the two municipalities of Asansol—(population 21,727) and Raniganj—(population 14,536).

The population of the settlement, according to the census of 1921, is 329,353 to which should be added an estimated floating colliery population of not less than 100,000

The average rainfall of the Settlement is 59.17 inches per annum, the rainy season lasting from the beginning of July to the end of October. The average humidity during the dry season of the year is 16 per cent and during the wet season 50 per cent. The day temperature ranges from 116°F during the month of May, to 82°F during the rains, and 69.8°F in the cold weather (minimum 42°F).

The country is undulating and is for the most part high and dry with a laterite soil and therefore unfavourable for the spread of hookworm infection.

Owing to the investigations of Col Clayton Lane in 1916-17 into the existence of hookworm in the tea gardens of Darjeeling, it seemed desirable that similar investigations should also be made into its existence in the coal mines of Bengal, and in March 1918 the Asansol Mines Board of Health on the recommendation of the writer voted the necessary funds. The investigation was continued during the year 1921-22 on behalf of the Government of Bengal—a grant being made by Government for the purpose. The investigating staff were trained for their work under the direction of Dr Bentley, Director of Public Health, Bengal, whose kind assistance and advice throughout the investigation the writer expresses gratefully to acknowledge.

The investigation consisted in the microscopic examination of stools by Clayton Lane's "levitation" method, followed by the administration of 60 grains of powdered thymol and a purge of mag. sulph. to 10 per cent of all whose stools were microscopically examined, whether found positive or negative. This latter procedure not only gave naked-eye evidence of infection where it existed but also served as a check on the accuracy of the microscopic work.

Owing to the great area of the Mining Settlement and to the distances separating the majority of the collieries from the headquarters station of Asansol it was found impracticable to set up a central laboratory. A field laboratory was therefore established in each group of collieries in turn.

The greater proportion of the miners in the coal fields of Bengal are Santhals, an aboriginal race inhabiting the Santhal Parganas and part of the District of Bankura, tracts of country which lie to the north-east and south-west of the Mining Settlement and separated from it by the rivers Adjoy and Damoodar respectively. At the outset of the investigation serious difficulties were immediately encountered as the Santhal labourers, especially the women, proved altogether unwilling to

submit stools for examination, and as labour in coal mines, in contrast to that in tea and jute, is "uncontrolled" in any way, working in close proximity to its permanent domicile, and being in a position to come and go at will, no pressure of any kind could be brought to bear on the miners to furnish the necessary stools.

A solution of the difficulty was at length found by giving lectures illustrated by magic lantern slides explaining the objects of the examination, and by the various colliery authorities concerned offering a reward of two annas for each stool submitted. The rewards were discontinued as the investigations proceeded.

The method of collecting stools was as follows—Each evening small numbered unglazed earthen pots such as are common in Indian bazaars were distributed to a certain number of workers whose names were registered for the reception of the specimens of faeces to be examined. These pots were then collected the following morning and taken at once to the laboratory for microscopic examination. As stated above a further test of the accuracy of the microscopic examination was subsequently made by giving a full dose of thymol followed by Epsom salts to 10 per cent of those found microscopically negative as well as positive and for this each subject received a reward of two annas in addition to full pay while incapacitated from work.

By the exercise of much patience and tact and the distribution of rewards where necessary at length 3,356 men and 991 women were examined—4,347 persons in all—of which 72 per cent of underground labour and 53 per cent of surface labour were found to be infected, the average number of worms found after administration of thymol being 28 per individual in underground labour and 14 in surface labour, the difference in the rate of infection being readily accounted for by the more favourable conditions for infection existing underground.

Of the worms passed after administration of thymol 70 per cent were found on examination to be *Necator americanus* and 30 per cent *Ancylostoma duodenale*, the infection in all cases being a mixed one.

The hæmoglobin index of each individual examined was also ascertained by the Fallquist method and it was found that whereas the average hæmoglobin index of the uninfected was 80 per cent, the index of the infected was 65 per cent.

Investigations were then made into the infestation of the underground workings with hookworm larvæ by the Boycott method of larval cultivation and it was found that of the 184 mines examined 153 were infested, giving an infestation rate of mines of 83.20 per cent. The intensity of the infestation of mines may be said to be low in view of the small

average number of worms found per individual in underground workers

The detailed result of the investigation is given in the subjoined table —

those areas commonly used by the villagers for defecation Larvæ were, however, occasionally found in these areas during the rains (July to November), and were constantly

	Total No of cases examined	Total No positive	Percentage positive	Total No of males	Total No of females	Percentage of positive males	Percentage of positive females	AVERAGE HÆMOGLOBIN INDEX				Average No of worms per individual	Species of hookworms found
								Percentage of positive males	Percentage of positive females	Percentage of negative males	Percentage of negative females		
Underground labour	3616	2604	72.01	2826	790	73.92	65.19	67.50	65.00	79.90	80.30	28.00	N A (80%) A D (20%)
Surface labour	731	389	53.21	530	201	54.34	50.24	69.69	68.00	82.90	82.00	14.00	N A (83%) A D (17%)

On the completion of the investigation of the degree of infection of the colliery population of the settlement, the investigation of the village population was begun. The village population in the Mining Settlement consists principally of two elements, higher caste Hindus, and low caste Bowries, the latter being an aboriginal race indigenous to the locality which possesses its own quarters in almost all the villages of the settlement and in addition to following agricultural pursuits, works also as surface labour in the surrounding collieries. Only the non-colliery population of the villages is here however, taken into account.

The same difficulties previously met with in collieries were also encountered in villages but by giving magic lantern lectures and by securing the help and co-operation of literate and influential villagers these difficulties were gradually surmounted. After the magic lan-

tern demonstration a certain number of volunteers were as a rule secured in every village and when the stools of these had been microscopically examined and worms subsequently demonstrated after administration of thymol and mag sulph in those found positive opposition and incredulity were at length overcome and the investigation could proceed. Investigations were also made in numerous villages into the infestation of the soil with hookworm larvæ and it was found that during the dry season of the year from November to June no larvæ were to be found even in

found at all seasons of the year in the mud around the margins of ground tanks (ponds) used by the villagers for washing after defecation. It is therefore likely that hookworm infection in villages in this part of Bengal is chiefly maintained by the infestation of the muddy margins of ground tanks and to a limited degree only by the infestation of the soil.

The average number of worms found per individual in villages was 9 in the lower castes and 7.5 in the higher castes, 64 per cent of the worms being *Necator americanus* and 36 per cent *Ankylostoma duodenale*. The infection in these cases also was a mixed one.

The average hæmoglobin index of those found infected was 67.78 per cent and of those uninfected 79.9 per cent.

The detailed result of the investigation in villages is given in the subjoined table —

	Total No of cases examined	Total No positive	Percentage positive	Total No of males	Total No of females	Percentage of positive males	Percentage of positive females	AVERAGE HÆMOGLOBIN INDEX				Average No of worms per individual	Species of hookworm found
								Percentage of positive males	Percentage of positive females	Percentage of negative males	Percentage of negative females		
Illiterate lower castes	337	146	43.32	234	103	48.29	32.0	66.35	65.93	79.92	79.93	9.00	N A (60%) A D (40%)
Literate higher castes	504	166	33.13	300	124	35.26	25.80	73.85	65.61	80.15	79.78	7.50	N A (67%) A D (33%)

tern demonstration a certain number of volunteers were as a rule secured in every village and when the stools of these had been microscopically examined and worms subsequently demonstrated after administration of thymol and mag sulph in those found positive opposition and incredulity were at length overcome and the investigation could proceed. Investigations were also made in numerous villages into the infestation of the soil with hookworm larvæ and it was found that during the dry season of the year from November to June no larvæ were to be found even in

Enquiry was next prosecuted into the degree of infection of the urban population living in the municipalities of Asansol and Raniganj. Little or no difficulty was experienced in collecting stools in urban areas, and the degree of infection as anticipated was found to be considerably lower than in either rural areas or in mines. The existing infection in the towns of the Mining Settlement is doubtless due to bathing in infested ground tanks to the drinking of contaminated tank water, and to previous residence in rural areas.

A difference in the degree of infection of the municipal population is to be noted between those who, living in the centre of the towns habitually use latrines, and those who living in the outskirts defecate when convenient on the soil

The average number of worms found per individual in municipalities was 6 in occasional users of latrines and 4.25 in habitual users, 72 per cent of the worms being *Necator americanus* and 28 per cent *Ankylostoma duodenale*. The infection here was also a mixed one

The average hæmoglobin index of the infected was 67 per cent and of the uninfected 80 per cent

The detailed result of the investigation is given in the subjoined table —

be regarded as of little or no economic importance

The infection is met with amongst 72 per cent of underground workers and 53 per cent of surface workers. It is twice as heavy amongst the former as the latter, the average number of worms per individual found amongst the former being 28 and amongst the latter 14

The hæmoglobin index amongst the infected is 12 per cent to 15 per cent lower than amongst the uninfected, the average hæmoglobin index of the uninfected being 80 per cent

83.2 per cent of mines are infested with hookworm larvæ

No practical remedy for the elimination of

	Total No of cases examined	Total No. positive	Percentage positive	Total No of males	Total No of females	Percentage of positive males	Percentage of positive females	AVERAGE HÆMOGLOBIN INDEX				Average No of worms per individual	Species of Hookworms found
								Percentage of positive males	Percentage of positive females	Percentage of negative males	Percentage of negative females		
Occasional users of latrines	230	67	29.13	215	15	29.76	20.00	6.20	65.66	78.94	79.50	6.00	N A (70%) A D (30%)
Habitual users of latrines	271	26	9.50	215	56	9.76	8.92	64.48	69.60	80.00	79.76	4.25	N A (72%) A D (28%)

With regard to prophylaxis in mines, although latrines could be established on the surface without difficulty, it would be almost impossible owing to the primitive habits of the labour employed to secure their regular use. A great proportion of the labour on collieries moreover is of the "floating" type, working for a few months only at a time on collieries and returning in the intervals to their homes. The risk of re-infection cannot therefore be eliminated and the establishment of latrines on the surface could have little or no permanent effect on the rate of infection

The successful establishment of latrines underground with a view to prevent the infestation of underground workings would be more difficult, since so many opportunities exist in the darkness underground for evading their use

For the successful establishment of latrines throughout the villages of the settlement, insuperable difficulties would have to be overcome not only as regards expense but also in the matter of caste prejudices, and in the eradication of long established racial habits and customs

SUMMARY

Hookworm infection is found amongst the majority (70 per cent) of the workers in the coal mines of Bengal but without causing any apparent hookworm disease. It may therefore

hookworm infection amongst the workers in the coal mines of Bengal can be suggested, having regard to the habits and customs of the primitive races from amongst whom mining labour is chiefly drawn

Hookworm infection in general in the Asansol Mining Settlement is a light one. It is heaviest and most frequent in underground miners, less heavy and frequent in colliery surface labourers, still less in agriculturists, and least of all, in the urban population

The predominant species of hookworm in the Asansol Mining Settlement is *Necator americanus*, which constituted 70 per cent of the total number of worms examined. The infection in all cases was a mixed one

SOME NOTES ON A MALARIA INVESTIGATION ON A SUGAR ESTATE IN KAMRUP, ASSAM

B. B. S. CHALAM, I.R.C.P. & S. (Edm.), CAPT (S.R.)
With an explanatory note by

T. C. McCOMBIE YOUNG, LT-COL., M.D., D.P.H., I.M.S.,
Director of Public Health, Assam

Prefatory Note by Lt-Colonel T. C. McCombie Young,
I.M.S.

In 1920 I was asked to investigate the prevalence of malaria on Messrs Bird & Co's Sugar Estates at Topolia, Kamrup, which had recently been acquired by them from Government

The estate is situated 17 miles north of Nalbari railway station, some 8 miles from the Bhutan foot

hills in a country which is open grass land, in places bearing evidence of having been cultivated in comparatively recent times. Among the Kachari inhabitants all this country has an evil reputation for ill health, and it is very sparsely populated, but no record of the causes which led to its depopulation seems to exist, and whether these causes were due to the prevalence of malaria or to the incursions of the Bhutias or both cannot be determined.

The area of the estate is some 10,000 acres, and it lies between the present course of the Pagladia and an abandoned bed of that notoriously capricious stream. The general slope of the country is from north to south and the soil is said to be a rich loam overlying pervious sand. The level of the sub-soil water, in the cold weather is within some six feet of the surface of the land on which the farm is situated, while in the rainy season it is almost at ground level, and it is said to fluctuate independently of local rainfall, doubtless owing to the influence of rain in the hills. The sub-soil water is heavily laden with iron salts which readily go out of solution by aeration or filtration. The rainfall is about 100 inches annually. To the north and north-east of the estate lies a swamp from which issues a stream which runs past the coolie lines of the plantation to form the Lebra Nadi. To the west, at a distance of over a mile, is another small stream running south in whose course lies some swampy land. There is no forest or scrub jungle in the neighbourhood and the vegetation round the lines is for the most part 'thatch' grass, except where sugarcane is under cultivation or where the swamp vegetation exists.

The labour force employed in both concerns in 1920 numbered some 800 persons and consisted chiefly of Mundas and Oraons, a few Nepalis and up-country mistris also being employed in the estate.

The superior officers, Europeans and Anglo-Indians as well as the labour force suffered severely from malarial fever which causes a considerable amount of inefficiency in those who are unfortunate enough to be infected. To get the index of the malariousness of the estate, in 1920, I performed a splenic census of the children in the lines, new arrivals being separated from those who had been in residence for over a year. I examined 36 children who were new arrivals of whom 3 showed some slight splenic enlargement, but out of 73 children who had resided over a year in the lines, only 13 were normal, 37 showed slight splenic enlargement, 17 showed considerable enlargement and 6 showed very large spleens. Thus 82 per cent of resident children showed splenic enlargement, against 8 per cent with splenic enlargement among newcomers, and this observation rather emphatically illustrated the undoubtedly malarious condition of the place.

The question for consideration was therefore, what is the cause of the unusual malariousness and how may it be alleviated, i.e., what are the breeding grounds of the carrier mosquitoes and how may breeding in them be abolished or controlled? These were questions that one was not prepared to answer on the evidence obtainable in three or four days time, and it was clear that a series of continued observations was necessary to enable one to make with any confidence recommendations whose acceptance might entail a very large expenditure. To obtain this information it was recommended that the data necessary to enable one to form an opinion might be collected under my directions by a trained Assistant Surgeon in residence on the spot whose duty it would be to keep the breeding grounds I have mentioned and all other collections of water under observation for a year, catching larvae, hatching out, and mounting adult mosquitoes, which would be sent to my laboratory for identification.

These recommendations were accepted and Captain B. S. Chalam M.S., was selected by me and appointed by Messrs Bird & Co., in August 1920. The investigation has been carried on by him first under my directions, and latterly as he gained experience, on his own initiative and with his report which is in-

cluded in this paper, the investigation, in which we had in 1921 the assistance of Lt.-Col. S. R. Christophers, C.I.E., O.B.E., I.M.S., has terminated. Lt.-Col. Christophers' paper in regard to this investigation has already been published, and Dr Chalam's later observations have been carried out in accordance with his advice. The outcome of the finished investigation appears to confirm the forecast given by Christophers in 1921, and the conclusions which one would draw from it are as follows.

The commercial success of the undertaking has been hampered by the causes which in the initial lay-out of the estate assigned the best land to sugar growing, leaving only the trimmings and odd pieces for the lines and quarters of the labour force and for the bungalows of the staff. These sites adjoin a swamp and stream, on the banks of which the lines are situated and the investigation has demonstrated that the nearer the swamp, the greater is the house infestation by malaria-carrying mosquitoes and the greater is the number of attacks of malarial fever per house. It does not appear that larvicidal measures in the stream or swamp would prove a useful palliative, and it seems as if the only practical anti-malarial measure would be the removal of the lines of the labour force to some more healthy situation in the centre of the estate as remote from the swamp as possible, surrendering for this purpose some part of the land at present devoted to sugar cultivation. Dr Malcolm Watson's success by similar measures of removal of Malayan rubber plantations from the neighbourhood of 'carrier' producing localities to more healthy sites, may be cited as a precedent supporting this view.

The general conclusions from these observations are interesting and important. They appear to give a reasonable hope that if the mistakes which have been made in the lay-out of this estate are avoided by future undertakings of the same kind in this area, it should be possible to keep the prevalence of malaria among their labour force within such control that malarial prevalence will not have to be reckoned as a deterrent to the expansion, in this neighbourhood, of what may prove to be a new industry for Assam.

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REPORT BY CAPT B. S. CHALAM, MEDICAL OFFICER, ASSAM SUGAR ESTATES AND FACTORIES LTD., NALBARI (E. B. RY.), ASSAM

The observations during the year were conducted mainly on the following lines—

Investigations suggested—A To determine the actual quantum of anopheline production in the different kinds of breeding places and in the different parts of the area.

B To determine the relative liability to malaria and anophelism of different parts of the estate.

C To determine the actual relation of *A. vagus* (Donitz) to infection in the estate.

Species of anophelines—Before dealing with the measures adopted with regard to the above investigations, I tabulate below the different species of anophelines that have actually been detected in the estate up till now. During the year 1920 the following species were detected—

- 1 *Anopheles vagus* (Donitz)
- 2 *Anopheles listoni* (Liston)
- 3 *Anopheles minimus* (Theob.)
- 4 *Anopheles sinensis* (Wied.)

5 *Anopheles barbirostris* (Van der Wulp).

6 *Anopheles fuliginosus* (Giles)

7 *Anopheles kochi* (Donitz)

The relation of the above species to the different breeding places in the estate and their seasonal prevalence have already been stated by me in a previous report, and as a result of my observations in 1922, I again confirm what I have stated before as regards the above species

During the year 1921, in addition to the species already enumerated, I found *Anopheles maculatus* (Theo) in the months of October and November, and subsequently in larger numbers in 1922 from April onwards. This species was not caught as adults in houses but was all bred out from larvæ. Larvæ of this species were mostly found in and about the stream on the eastern side of the estate, along with *A. listoni*. During the year 1922 yet another species was detected in addition to those mentioned above. This was *Anopheles culicifacies* (Giles) and was detected in the month of June. Larvæ were found in water stagnating in the paddy fields close to the new coolie lines, and adults were also caught in the houses near by in the new coolie lines. The total number of this species obtained both from larvæ and as adults was about 30. Very careful search for this species in other localities in the estate and during the subsequent months failed to reveal its presence. It remains to be seen whether, like *A. maculatus* which though scarce in 1921 was found in larger numbers in 1922, *A. culicifacies* will also be found in greater numbers in 1923, though the advent of this particular species here is far from welcome, as it has been proved to be a virulent carrier of malaria in other parts of India.

Method of Investigation. With the above named nine species to work upon, the plan of procedure adopted in the investigation of points (a) and (b) was as follows. A plan of all the bungalows and huts in the estate was prepared, and each house received a number. Exactly one hour was allotted to each house for the catch of adult anopheles in it and various points such as number caught, species, sex, etc., were noted. The period selected for the adult anopheline survey was the rainy season, extending from May to October, for the reason that it is only then that collections of water are equally distributed throughout the estate, and as there are equal chances of breeding all over the estate, a preponderance of adults of any species in any particular area will indicate a preference on the part of that particular species for the environment of that particular area. During the other months of the year the estate is practically dry except for the swamp and the stream and the chances for breeding are not therefore equal in all parts of the estate, so that the preference of any particular species for any particular area cannot be ascertained. Attempts were made however to catch adult anophelines in December 1922 and January 1923 (the coldest and driest months locally), and I shall deal with them later on in this report.

Total adult anopheles caught.—The total number of adult anopheles caught in the huts and bungalows during this investigation was 2,446.

Species caught as adults.—The adults caught, when classified, were as follows—

	Total	Males	Females
<i>A. vagus</i>	1,237	188	1,049
<i>A. listoni</i>	1,077	70	1,007
<i>A. fuliginosus</i>	52	nil	52
<i>A. sinensis</i>	49	nil	49
<i>A. culicifacies</i>	31	3	28
Total	2,446	261	2,185

The proportion of adult males to adult females was as 1 : 8.

The average number of mosquitoes caught in a house during one hour's search comes to 10.5. The average number of *A. listoni* caught per house during one hour's search was 4.6. The total number of

houses in the estate, as numbered by me for this investigation, is 231.

The percentage of the different adult anopheline species caught during the search works out as follows—

A. vagus—50.5 per cent.

A. listoni—44.3 per cent.

A. sinensis—2.033 per cent.

A. fuliginosus—2.1 per cent.

A. culicifacies—1.2 per cent.

Not a single specimen of the other species mentioned in the list given at the beginning of this report was caught as adults. They were all grown from larvæ.

With a view to determining in what part of the estate *A. listoni* predominates the houses were grouped into three different categories, A, B and C, according as they are furthest away from the swamp and stream comparatively nearer to the swamp and stream and nearest to the swamp and stream respectively.

Number of houses in A, furthest from the swamp and stream—58. Number of houses in B comparatively close to the swamp and stream—109. Number of houses in C nearest to the swamp and stream—64.

With regard to the problem of *A. listoni* in these three groups the following figures are of interest—

Number of houses		<i>A. listoni</i> found		Average number per house in one hour
		Males	Female	
A	58	3	93	1.6
B	109	28	510	4.9
C	64	39	404	6.8

From a perusal of these figures it is at once apparent that the two outstanding species of anophelines in the estate are *A. listoni* and *A. vagus* (for purposes of this report I include *A. minimus* when referring to *A. listoni*). The numbers of other anopheline species detected is so small that any likelihood of these species being the cause of trouble here need not be taken into consideration. Thus the enquiry reduced itself to this—

A. listoni and *A. vagus* being the two most predominant species locally are most likely to be the cause of the prevalence of malaria. If so, is it due to one or both of these species? To elucidate this question dissection of the two species caught at the same time and place was carried out to determine whether they were infected, and the actual sporozoite rates in those that were infected were—

Species	No dissected	No with sporozoites	Percentage of infection
<i>A. vagus</i>	412	0	0
<i>A. listoni</i>	315	12	3.8%

The above figures indicate that *A. vagus* though abundant is harmless, and that *A. listoni* is infected the actual sporozoite rate being 3.8 per cent. We may conclude that as far as transmission of malaria in the estate is concerned *A. listoni* is the chief and most probably the only culprit. Referring once more to the above figures and the house infestation the difference in numbers is striking between the adult *A. listoni* caught in habitations bordering on or close to the swamp and stream and those caught further away from them. This suggests a comparison of the breeding places of *A. listoni* with the results of the catch of adult *A. listoni*. I have noted that the largest number of larvæ of *A. listoni* were collected in and about the stream and swamp on the eastern side of the estate, and a few were also found in some drains in the cane plantation. From a comparison of these two factors it appears to be possible to state that *A. listoni* breeds extensively in the stream from the swamp as noted by the actual collection of larvæ from

there and verified by the catch of adult *A. listoni* in B and C, the areas nearest to the stream and swamp.

The nearest part of area A to the stream is about three furlongs from it, and the remotest part of area A from the stream is more than a mile away. The presence of comparatively few *A. listoni* in area A may be accounted for either by the flight of some stray *A. listoni* bred out from the stream or, the few that may be bred out from the drains in the cane fields. The difference in numbers in the adult *A. listoni* found in A from those found in B and C however is glaring and gives food for reflection. Anophelines are known to be selective in the choice of their breeding grounds and some species select a particular kind of breeding place in preference to others.

The corollary to this is, that if in the dry season a suitable breeding ground for a particular species does not exist, that species may be absent. Referring to the catch of adult anophelines here in December 1922 and January 1923 in the first place, the number caught was exceedingly small. Except in Mr Stone's bungalow and a few other adjoining houses in area C I was unable to catch any, although several attempts were made.

The total catch here in two months was only 54. According to species they were as follows—

	Total	Males	Females
<i>A. listoni</i>	46	nil	46
<i>A. fuliginosus</i>	5	nil	5
<i>A. fuliginosus</i> (var <i>nagpori</i>)	3	nil	3
Total	54	nil	54

The complete absence of *A. vagus* during this catch is at once significant. Whereas *A. vagus* was abundant in every catch in every house during the rainy season, it completely disappeared during the driest season. Those particular breeding grounds which perhaps *A. vagus* requires, such as shallow puddles in the rainy season, were apparently absent during the dry season and this evidently accounts for its entire absence. *A. listoni* though very few in numbers, were still to be caught and some of them were even recently hatched. This shows that the breeding grounds suitable for *A. listoni* existed here even in the dry season, and as the only possible breeding ground in the estate at this time was the stream from the swamp, the inference once more is that the stream is the chief factor concerned in the propagation of *A. listoni*.

Endemic Index.—An outbreak of small-pox having occurred in October 1922, in the adjoining village of Topolia it was decided to vaccinate every one in the estate. An opportunity was taken of this occasion to divide them into three different groups, A from new lines, B from old lines, and C from the factory lines. The splenic indices of the children in each group was carefully noted and were as follows—A 88 per cent, B 84 per cent, C 74 per cent.

Hospital Statistics.—These figures, though they may not be very accurate have still been kept with great care. They point to a greater incidence of malaria in areas B and C than in area A.

Total number of cases treated for malaria in 1922—792
Total number of cases of malaria from area A—112
Total number of cases of malaria from areas B and C—680

Summary.—After the collection of this evidence and a series of voluminous reports on malaria in this estate from August 1920 to January 1923, my conclusions are as follows—

1. *A. listoni* and *A. vagus* are the predominant species of anophelines.
2. The actual number of the other seven species detected here is so small that any source of danger from them is practically negligible.
3. On actual dissection of a large number of *A. vagus* and *A. listoni* it has been found that *A. vagus* is not infected and therefore harmless as far as

transmission of malaria is concerned. *A. listoni* is infected and is therefore the chief carrier of malaria in this estate.

4. By actual observation of the breeding places and the adult catch of anophelines here, the evidence points decidedly towards the fact that *A. listoni* in this estate breeds chiefly and extensively in the following areas—(a) in and about the swamp, (b) in and about the stream.

5. Anti malarial operations therefore should be directed against those breeding grounds of *A. listoni*.

A. culicifacies.—This species, as has been stated before, was first observed here in June 1922. The larvae were found in stagnant water in the paddy-fields in area A. The adults were found in the houses close to the paddy-fields in area A only. Attempts to find the larva or adults of this species in other situations in the estate proved futile. This raises the question whether *A. culicifacies* has a special predilection for paddy-fields for the growth of its larvae, in which case the location of houses close to paddy-fields in the estate will have to be re-considered. Further observations on this particular species are necessary during the coming rainy season.

The ordinary coolie is a fatalist and he regards his malaria as no more than a necessary adjunct to his miserable existence. His fatalism seems to be as powerful in anodyne as the faith of Nero's victims. Above the coolie strata of culture we come to the layman, who whilst also appreciating the pros and cons of a problem still looks askance at research directed to cataloguing the hairs on the grubs of mosquitoes as likely to be of any value to any one. He is inclined to judge any scientific observation upon its obviously utilitarian merits. The history of malarial research work is a valuable lesson to such people for the source of the brilliant practical results achieved in the Malay States and in the Panama Canal really goes back to the time when certain investigators commenced work on the minute anatomical distinctions between the larvae of different species of anophelines, and as a result discovered the important fact that almost every species of anophelines has some special type of breeding place which it prefers above all others, and which in some cases it must have if it is to flourish to any extent. From this small commencement the broad outlines of the selective breeding habits of most of the common species have been determined, and gradually such a wealth of knowledge regarding the activities and depredations of the anophelines has grown up that it would not be far short of suicidal if advantage is not taken of it to make use of this knowledge in the eradication of malaria. It is known and proved beyond doubt that malaria is carried by anophelines and it is generally supposed that the operations necessary to reduce malaria are of a somewhat routine and stereotyped character. But so varied and unknown are many of the conditions relating to malaria in different tracts and so different the possible and most promising ways of combating malaria when these exact conditions are known that it is essential above all that these precise conditions should be known wherever it is hoped to undertake large and almost necessarily costly anti-malarial operations. In other words anti-malarial operations must be preceded by a malarial survey. It is evidently with this object in view that Messrs Bird & Co were advised to undertake a malarial survey of this estate first. After two years of investigation, I hope that my efforts have been useful in so far at least as to point to a definite line of action instead of groping in the dark and have thereby justified the undertaking of this malarial survey.

A NEW TREATMENT FOR NAGA SORE

By R. B. ABRAHAM, M.R.C.S., L.R.C.P.,
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NAGA SORE is the name given to a very malignant and chronic form of ulcer which is

met with by medical officers of tea gardens in Assam. They are more concerned with the treatment of these ulcers than with their etiology, bacteriology or pathology.

In the differential diagnosis it is not difficult to distinguish them from other ulcers which are met with in a tea garden practice. The ulcer may be described as practically always occurring on the lower extremity, most commonly on the shin and round the ankle, but it is rarely found on the upper extremity and I have never seen a case on the trunk or head.

The ulcer is punched out with a spongy, yellow, sloughing base. On removal of the slough the base readily bleeds. It spreads rapidly, if not treated, to any size, always in a downward course, and in a bad case will dissect out the tendons, nerves and vessels and expose the bone. In these cases necrosis generally occurs necessitating later removal of the necrotic piece of bone. Glandular enlargement is not a usual phenomena.

The definite bacteriology of these ulcers is not complete. Capt E. C. R. Fox, I.M.D. examined a series of cases in Shillong, and the result of his work can be roughly summarised as follows—The general bacteriological picture of pus taken from the base of a typical ulcer shows a profuse number of Gram-negative, motile, large, fusiform, anaerobic sporing bacilli and numerous Gram-positive cocci. The spirochæte of Vincent is also present during the most typical phase of lesion.

As to what causes the Naga sore little is known, but there is no doubt that when an epidemic is fully established any sore or abrasion may develop into a typical ulcer. This has even been seen to follow a septic hypodermic injection.

The rapid spread of an epidemic is peculiar, seeing that Capt Fox was not able to produce artificial ulcers of a typical nature in animals after subcutaneous injections or vaccination with scrapings from the base of an ulcer. That the epidemic usually occurs in the rainy season, i.e., from March to October, there is no doubt. At this time leeches, mosquitoes and flies are very prevalent and may be primary factors, or the *bonguti* spear grass may pierce the skin and often leaves the seed imbedded. I have found such seeds in small pustules on coolies' legs, which have later turned into ulcers. On the other hand, against this theory, we have the fact that these grasses are a cause of great trouble to dogs and other animals, but I have never seen ulcers result. I have noticed that during the epidemic season nearly all cow-herds suffer from ulcers. They move about in this grass, which may be a point in favour of it as a causative agent.

The small eye-fly *Siphonella funicola* is no doubt one of the agents in spreading this and other infections.

Treatment—The following drugs and treatments which I have tried are numerous, and have given no very definite results—

Dry Applications—Ac Boracic, Ipecac Pulv, Quinine powder, Charcoal, Hydrarg Perchlor powder, Iodoform, touching with various caustics, Tannic Acid etc.

Wet Applications—Lotion Ac Boracic, Lotion Carbolic, Lotion Formalin Solution, Paraffin oil, Bathgate's yellow solution of Flavine, Liq Hydrarg Perchlor, saline compresses of various strengths. Scraping I have not found a success.

The Healing Ulcers—Here any simple ointment seems to suit and I have found none of any special value. I find that whatever local treatment is given, the ulcer should always be kept as clean as possible. Leaking pus from the ulcers seems to cause degeneration of the healthy skin and hence spread of the ulcer. The application should only be applied to the ulcer and not to the surrounding healthy area, as if this is kept moist it seems to break down readily.

My best results until two years ago were obtained with Lotion Ac Carbolic 1—40. This cleans the ulcer, but it is very painful, and healing does not occur rapidly.

For the past two years I have been using a solution of Calx Chlorinata and have had most satisfactory results. I apply the first few dressings hot. This readily cleans the ulcer and healing rapidly takes place.

Combined with this I have treated a series of 50 cases with intravenous injections of antimony tartrate. After the second or third injection the slough separates, leaving a healthy red base.

The difficulty in using Calx Chlorinata is that the bleaching powder supplied to gardens is not always up to full strength, or if so very rapidly loses some of its available chlorine.

The difficulty in using antimony tartrate is that it must be given intravenously. I generally use a 2 per cent solution and begin with a $\frac{1}{2}$ c.c., giving an injection every other day with increasing doses. I find coolies take readily to this treatment, and on the gardens where I have tried it the epidemic has not been severe.

I find that once the patient is put under the antimony tartrate treatment the ulcer will heal with any local application, and in some cases I have dressed them with plain water.

A Typical Case—A female coolie aged about 45 years, with three ulcers on her leg, all larger than a rupee. She was under ordinary treatment for three weeks, but the ulcers showed no signs of clearing up. On the 16th September 1922, she received 0.5 c.c. of 2 per cent antimony tartrate intravenously. On the 20th, 23rd and 27th September she had increased doses of injections. On the 2nd October 1922, she was discharged cured.

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OCTOBER

THE MEMOIRS OF SIR RONALD ROSS *

THE recently published memoirs of Sir Ronald Ross form a most fascinating book. Ross is of mixed English and Scotch parentage and his father was a well-known soldier, General Sir Campbell Ross. Ronald Ross is the eldest of a family of ten, he was born in Almora in the fateful month of May 1857. He lived partly in the plains and partly in Naini Tal until the age of eight when he was sent to England. From his earliest years he gave evidence of having an active and imaginative brain which refused utterly to work in an orthodox and conventional manner. As a boy, painting, natural history, poetry and music were his favourite pursuits, and when he reached the age of seventeen and it became necessary to think of a profession, his desires were to become an artist or a soldier, but his father insisted on his becoming a doctor with a view to putting him into the Indian Medical Service. Here at least was one case in which a career which was forced on an unwilling victim was justified by its results, though it is possible that Ross retained a subconscious resentment against his fate, for he never took kindly to the service and finally got out of it at the earliest possible moment.

During his student days at "Barts" his interests were more in music and poetry than in medicine, and he took a low place in the entrance examination for the I. M. S. in 1881. During the first few years of his service Ross engaged enthusiastically in the pursuits of poetry, mathematics, music and fiction writing. He also entered with zest into the sports which were available to the regimental medical officer. When he first took leave in 1888 he was disillusioned and depressed, and his own accounts of his condition suggest that he was a victim of tropical neurasthenia.

During his first leave he studied bacteriology under Klein, took the new-fangled Diploma in Public Health, wrote a romance and entered into matrimony. On his return to India he showed an interest in malaria but failed to recognise the parasite which had been discovered ten years previously by Laveran. He regarded the discovery as a mistake or even a fraud. He also studied mosquitoes, wrote much poetry and worked hard at mathematics for which he had a decided genius.

On his second leave to England in 1894 he was shown the error of his ways regarding the

malarial parasite through making the acquaintance of Manson, who showed him specimens of crescent bodies. In those days new scientific discoveries in medicine were not so speedily recognised by the profession as they now are and Ross himself in after years had painful experience of this lack of receptivity of his own discoveries by members of his own service. His acquaintance with Manson was probably the turning point of his career, for thereafter he became possessed of a mania for the study of malaria, and when he returned to India his first obsession was to test Manson's view that the flagellating bodies which are given off from the crescents were a phase in the life history of the parasite and were the first stage of a development which took place in the mosquito. The after stages were wrongly believed by Manson to consist in the escape of the developed parasites from the body of the mosquito into drinking water in which the insects were drowned. Acting on this belief Ross attempted, without success, to reproduce the disease by giving the water in which infected mosquitoes had died to human beings, including himself. In 1896 he wrote to Manson that the belief was growing in his mind that the disease was communicated by the bite of the mosquito. Manson was not at all prepared to agree, as he believed that mosquitoes bite only once.

The first experiments made by Ross at Sigur Ghat gave him the idea that all kinds of mosquitoes might not be capable of carrying the infection, and he made the acquaintance for the first time of "dapple winged" (*Anopheles*) mosquitoes. His previous work had been done with "grey" and "brindled" forms, *vix*, *culex* and *stegomyia*. After much work and much official discouragement he obtained some dapple winged mosquitoes (probably *Anopheles stephensi*), fed them on an infected person and in four days saw early developmental forms in the stomach wall of the mosquito. Having satisfied himself of the reality of this discovery he reported it to headquarters. Either *post hoc*, or, as Ross suspected, *propter hoc*, he was at once ordered to leave his station and was finally transferred to a non-malarious station, where his duties were of the most trivial nature. After a few months the intervention of Manson and Fayrer secured for him the opportunity of carrying out his researches in Calcutta for six months. During this period he was expected to investigate not merely malaria but also kala-azar in Assam.

In Calcutta there was a difficulty in finding suitable crescent cases in human beings, so Ross took up work on the proteosoma of birds, believing that the life cycle of this parasite would be similar to that of the human malarial parasite. Within a short time he worked out the full life cycle, demonstrating the collection

* Memoirs, with a full account of the Great Malaria Problem and its Solution. By Sir Ronald Ross, London, John Murray, 1923. Pp 547. 24s net.

of sporozoites in the salivary glands of the infected mosquitoes and showing that the parasite could be conveyed to uninfected birds by the bite of infected mosquitoes.

Ross regarded his work as being proof of the infection, not only of birds, but of human beings by the bite of infected mosquitoes, but the final demonstration of the truth of this belief was denied him. He had to turn to kala-azar, a disease which did not really interest him, and by the time that his period of special duty was over he was so exhausted that he had to take leave to England. Before leaving India he was assured that there would be no difficulty in obtaining permission to take up his work on his return, but no official guarantee could be given him. He had been disillusioned by official indifference in the past, and perhaps his overwrought condition made him intolerant of official formalities, so he retired from the service to complete his work without restriction.

It is most unfortunate that he was allowed to leave India without receiving even a formal expression of thanks from Government. But for the encouragement which was given him by the late Lt-Col Maynard, then editor of the *Indian Medical Gazette* and the friendly interest shown in his work by one or two medical men, it must be admitted that he received but little sympathy or recognition from his colleagues in Calcutta.

Thus in the little laboratory in the grounds of the Presidency General Hospital there was enacted a drama of greater importance to the world than the battle of Waterloo and yet hardly any one in Calcutta knows even of the existence of the laboratory.

It must be admitted that Ross suffered from the possession of an artistic temperament which was a source of considerable unhappiness to himself and perhaps it was owing to this characteristic that he was able to appeal only to the select few who had the vision to see the greatness of his work. Even Manson who helped and encouraged him at every step did not realise the magnitude of his discovery at first, and it was only little by little that the scientific world began to appreciate the vast potential change which his work had brought about on the future of humanity in malarious countries. Ross himself expected that others would appreciate as keenly as he did himself that the next logical step would be to put into practical effect the lessons of his discovery but the poor response to his appeals and efforts to secure a hearing in regard to this added to the disillusionment which embittered his after life.

Had Ross been a calm philosopher he would have waited patiently, but would a Ross of an equable temperament have wrested with feverish hands the great secret from Nature? When we are tempted to suggest that minds

like his might with an advantage be altered in some respect, we forget that the very faults of genius may be essential parts of its make up. Ross himself may be excused for thinking that the opposition which he encountered hindered him in his work, but it is just possible that if he had been the pampered favourite of officialism and society he might have lost the spur which goaded him to the highest pitch of energy.

When he retired he received ample recognition from such men as Laveran, Lister and Manson, but in spite of the fame and prestige which surrounded him, he found that a triumph in research in tropical diseases could only secure for him an offer of a post at the Liverpool School of Tropical Medicine on £250 a year with a guarantee of three years, and even this offer was hedged around with restrictions.

Ross felt the rebuffs and lack of recognition more keenly than the honours which later came to him, and it is not surprising that he should make bitter comparisons between the vastness of his discovery and the recompense which it received. The Nobel Prize of nearly £8,000 was almost the only substantial reward which he received for a discovery which must be worth untold millions of pounds to humanity, apart altogether from the vast toll of death and suffering which it prevents.

After making his first great discovery Ross wrote in his diary—

"This day designing God
Hath put into my hand
A wondrous thing. And God
Be praised. At His command,
I have found thy secret deeds
O million-murdering Death
I know this little thing
A million men will save
O Death where is thy sting?
Thy victory, O Grave."

Even now it is likely that we do not fully recognise the debt that humanity owes to Ross, quite certain it is that we have not yet taken full advantage of the gift which he placed at our disposal.

There is a proposal now before the public to show some sense of recognition of the work of Ross by establishing a Ross Clinic in Tropical Diseases in London. Will the Government of India do a trifling act of penance and at the same time benefit the people of India by establishing some suitable research in tropical disease in honour of Ross? If so, the most suitable place will be Calcutta where he won the last round of his great battle against malaria. It is a tragedy that the story of his life might appropriately be called "I Accuse" for Ross had good reason to find fault with many people, and he never hesitated to express his inmost feelings. His recognition of the help and encouragement given to him by the *Indian Medical Gazette* is unqualified, it

will always be a credit to this journal that it was so quick to recognise the value of his work and to defend him from the cunning attempts which were made to rob him of the credit for his discovery.

As a matter of historical interest the following facts connected with the story of malaria are quoted they show clearly that, apart from the first splendid deduction of Manson the whole story of the mosquito transmission of malaria was written by Ross. The final crucial experiment of the transmission of the infection to man was so clearly anticipated by Ross that he cared but little whether he himself or another put the matter to the test. It may be noted that unbiased fellow-workers such as Laveran and Koch admitted freely that the credit for the discovery was due to Ross.

Most of the quotations are from letters written to Manson.

1878—Laveran discovered the quartan malaria parasite.

1886—Golgi showed that there are different kinds of malaria parasites, which pass through certain phases in the blood.

1889—Theobald Smith and Kilborne showed that the Texas fever of cattle is conveyed by a tick, but they did not discover the parasite in the tick. This was the first instance of a microbial disease being proved to be conveyed by an arthropod though many persons had surmised that yellow fever and malaria might be conveyed by mosquitoes. For example, Finlay in 1881 suggested that yellow fever might be conveyed from man to man by mosquitoes and in 1883 Dr A. T. A. King gave many reasons why mosquitoes were likely to convey malaria. Laveran and Koch both had the same notion.

1894—Manson in conversation with Ross said "I have formed the idea that mosquitoes carry malaria just as they carry filariae."

Manson was much impressed with the appearance of 'flagellate bodies' which appear in connection with crescents; he surmised that these entered the stomach wall of the mosquito from the infected blood underwent further development in the tissue of the mosquito and found their way into drinking water. According to this conjecture, malaria would be contracted by drinking water in which infected mosquitoes had died.

1896—MacCallum found that the flagellating bodies fertilised 'crescent spheres' and gave rise to motile vermicules.

1896—Ross wrote to Manson "It is likely that only certain species of mosquitoes can carry malaria."

1897—20th August. Ross found in a laboratory bre (Anopheles stephensi) which had been fed four days previously on a malarial patient 'large cells with pigment (?) and numerous vacuoles' and on the following day in another mosquito of the same batch the bodies were still larger. The sketches and specimens show clearly that Ross had discovered the early stages of the growth of the malarial parasite and so proved that development of the parasite really occurred in the tissues of certain anopheline mosquitoes.

On August 22nd Ross wrote to Manson "They varied from 12 to 16 μ the outline was sharp, the shape spherical or ovoid they contained pigment indistinguishable from that of the haemazoa." On the 21st, "I killed my first brown mosquito. The same bodies only larger with a thicker outline. The largest were 20 μ ."

1898—23rd March, Calcutta "Pigmented cells exist in three out of four mosquitoes fed on proteosoma and increase regularly in size from about 4 μ after 30 hours to about 40 μ after about 85 hours."

30th March, Calcutta "In mosquitoes which have been fed a second and a third time on infected sparrows each feed is followed by a new crop of pigmented cells. Out of 15 mosquitoes fed on a healthy sparrow, I have not found a single coccidium. Out of 20 insects fed on a heavily infected sparrow with numerous proteosoma, every one contained coccidia, and some contained swarms of them." 23rd June, Calcutta "Another advance has been made. On the 6th and 7th day the coccidia form a large number of germinal rods (?) 12 μ in length."

4th July, Calcutta "On taking up the thorax a small clear round mass of tissue fell out and was seen to consist of mostly some worm-like gland. Rods were very numerous here and were seen to be enclosed in numbers in clear cells attached to this gland."

6th July "It is a thousand to one, it is a salivary gland." "I feel that I am almost entitled to lay down the law by direct observation—malaria is conveyed from a diseased person or bird to a healthy one by the proper species of mosquito, and is inoculated by its bite."

7th July "The germinal rods lying in the secreting cells of the gland pass into the duct and are thus poured out in vast numbers under the skin of the man or the bird. Arrived there numbers of them are probably swept away by the circulation of the blood in which they begin to develop into malarial parasites, thus completing the cycle."

9th July "On the 25th June I selected three healthy sparrows, their blood had been examined three times on different occasions and found free from parasites. On the 25th night and almost every night following I have used these birds to re-feed a large stock of mosquitoes which had been infected from diseased sparrows on 21st and 22nd June. This was the identical stock in which I had worked out the story of the germinal rods. All three birds, perfectly healthy a fortnight ago, were now simply swarming with proteosoma. Hence I think I may now say Q. E. D. and congratulate you on the mosquito theory indeed."

Ross conducted numerous other experiments of the same kind with identical results. Infected mosquitoes always caused infection in sparrows, uninfected mosquitoes never did.

September 1898—Bignami fed mosquitoes from malarious places on a man and in due course the man developed malaria. This experiment was commenced after the announcement of Ross's work in the *Lancet* of 30th August but Bignami did not acknowledge his indebtedness to Ross, besides the experiment was not conclusive, as neither the mosquitoes nor the patient were strictly under control, and, though it is reasonably certain that the mosquitoes became infected by biting infected persons and that the patient contracted the infection from mosquitoes infected in this way, the controls were by no means so complete as in the case of Ross's bird experiments.

It is perfectly clear that the credit for the discovery of the mosquito transmission of malaria is due entirely to the unrelenting work and the fertile imagination of Ross. For the first part of the discovery Manson perhaps deserves almost the greater share of the credit for the idea of the development of the parasite in the mosquito was his. Ross it was who found that only certain kinds of mosquitoes were suitable and that the infection was conveyed by the bite of the mosquito not by drinking water as Manson suspected. The Italian workers have made great additions to our knowledge of the subject, but their refusal to give due credit to Ross does not redound to their credit.

It must be noted that the terms employed by Ross to describe the developmental forms of the malaria parasite are not those in use at the present time. The drawings which accompanied his letters and notes are unmistakable evidence of the genuine nature of his findings.

The subsequent events consisted in the working out of the details of the life history of the parasite by the Italian workers, the proof by Ross that malaria can be controlled by the destruction of anopheles mosquitoes and the successful construction of the Panama Canal through the application of the principles stated by Ross. Thousands of other discoveries have been made by workers all over the world, all of which have served to emphasize the vast importance of the "great discovery."

A Mirror of Hospital Practice.

AN UNUSUAL COMPLICATION IN AN ACUTE CASE OF KALA-AZAR

By MONINDRA NATH DE, M.B.,

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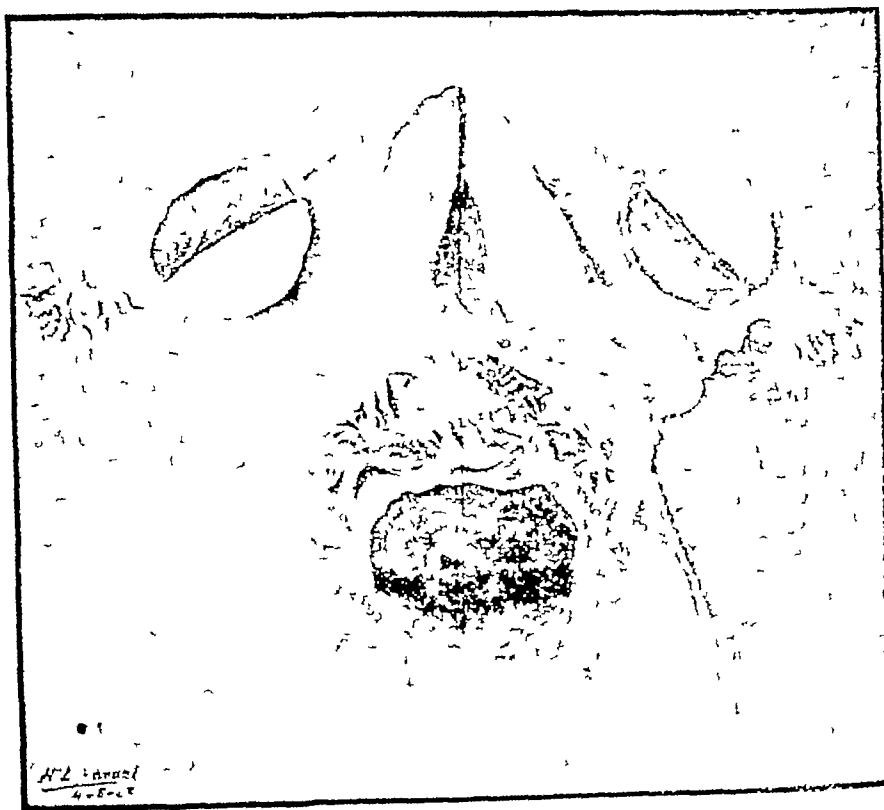
A HINDU female, aged 35 years was admitted to the wards of the Calcutta Medical College Hospital for the treatment of extreme anæmia and cachexia. On physical examina-

tion the neighbouring structures. The condition was regarded as being one of inoperable carcinoma of the cervix. Her condition was so serious that this diagnosis could not be verified and she died in a few days.

She was a parous woman with no striking previous history. The chart showed a sub-normal temperature throughout the period during which she was in hospital. No report regarding the blood picture of the patient is available. Fortunately a post-mortem examination was obtained which was done by Capt Shanks, Professor of Pathology, and the findings were as follows—

The heart was atrophied, its walls flabby and the right ventricle dilated. The valves were healthy. There was an atheromatous area at about 10 cms from the aortic valves. The liver was enlarged and fatty. The spleen was slightly enlarged, being 12½ ozs in weight. There was very slight thickening of the capsule. On section it was found to be of a deep red colour and its consistency soft and pulpy—very much like that of a septicæmic spleen. At one place there was a small triangular wedge-shaped area resembling a red infarct. The femoral and iliac glands as well as some of the mesenteric lymph nodes were enlarged to about twice their usual size and the last named were soft and friable.

In the vaginal cavity, there was present a greenish-black mass, which when removed was found to be the enlarged and cedematous



tion nothing tangible could be detected anywhere, except that she had an intensely foul-smelling sanious discharge from the vagina. A p.v. examination revealed a fairly large mass at the cervix uteri which was fixed to

cervical portion of the uterus. No actual ulceration could be detected.

Practically speaking, the lower half of the swollen mass was nothing but a big slough. There was slight adhesion to the bladder and

rectum, this being due to the considerable amount of inflammatory oedema which was present. There was no line of demarcation between the gangrenous and the healthy tissue, the upper inch or two of the vaginal wall being also involved. But the intensity of the process was less marked there than in that of the cervical portion. The body of the uterus and the appendages were quite normal.

The character of the splenic pulp was very suspicious of something systemic, such as septicæmia, and the presence of the red wedge-shaped area added more to the suspicion. However to ascertain if any causative organisms could be detected, a smear was taken from the spleen and stained with Leishman's stain and myriads of Leishman-Donovan bodies were found scattered all over the slide. We had never before this seen such large numbers of the parasites in a single microscopic field. Similar preparations from the liver presented a similar picture, with this difference, that the parasites were abundantly present in large swollen endothelial cells. The gangrenous portion of the cervix was examined but no parasites could be demonstrated. There were only stout bacilli and a few rounded bodies, probably altered leucocytes. Vincent's organisms could not be found.

Tissues from the liver, spleen and from the gangrenous cervical portion of the uterus were fixed and stained (by a special method to be described hereafter) and in the first two organs Leishman-Donovan bodies were very well demonstrated. The section from the cervix showed only degenerated uterine tissue.

The points in this case are of great interest. The patient in question had an abnormally heavy infection with Leishman-Donovan bodies and yet she was afebrile. The signs shown were anæmia, cachexia and, a very rare phenomenon noma of the cervix. Such cases of kala-azar must be existing in the epidemic and endemic areas, and they are liable to be overlooked as they have little or no enlargement of the spleen and as they fail to show a long-continued pyrexia. Hence, in such places, a patient suffering from general ill-health, anæmia and cachexia without any obvious cause for it should be looked upon as a possible case of kala-azar, and the specific treatment should be given a fair trial. We have seen more than one case and any medical man dealing with kala-azar patients must come across these atypical but clinically obscure cases of leishmania infection.

The formidable complication which this patient had is a rare condition. We frequently see cases with noma of the face, noma pudendi and noma of other parts relating to the skin and external genitalia, but I have been unable to find any reference in the literature to this phenomenon—noma of the cervix.

CONCLUSIONS

(1) A heavy leishmania infection may exist without much enlargement of the liver and spleen.

(2) Noma of the cervix, although one of the rarest complications may occur as well as noma of the face, genitalia and other parts. When it occurs in an elderly woman it is very apt to be regarded as a malignant disease.

A CASE OF ANEURYSM RUPTURING INTO THE PERICARDIUM

By K. KESAVA PILLAI, M.B., B.S.,

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I was called upon to do an autopsy. The body was that of a well-nourished middle-aged man of 40, and the muscles were well developed. There were three scars each about 1 in in diameter, one on the arm, one on the abdomen near the umbilicus, and one over the right thigh, pale in appearance.

The autopsy revealed the following conditions—

On opening the thorax the pericardium was found enlarged and distended and transparently bluish in appearance. The pericardial sac contained about 10 ounces of dark clotted blood. The right side of the terminal portion of the ascending aorta was sacculally dilated. The dilation extended in a fusiform manner upwards as far as the middle of the arch. The aorta at the dilation measured across $2\frac{1}{2}$ in and above that $1\frac{1}{2}$ in. The aneurysm was adherent below to the right auricular appendix and to the right side to the wall of the pericardium. The wall of the lower part of the dilated portion was bluish in appearance. At the wall of the aneurysm in front of the adherent portion, there was a rent with lacerated edges of about $\frac{1}{4}$ in diameter. In the aorta at the ascending portion there were five atheromatous patches including the one rupture, each measuring about $\frac{1}{4}$ in in diameter. The internal surfaces of these were smooth.

The heart was hypertrophied and weighed 13 ozs. The average weight in a South Indian in my opinion, is 8 ozs. The valves were not diseased and apposition was good. The arteries were not atheromatous and the kidneys were apparently healthy. The cerebral arteries were also not atheromatous.

All other organs were found healthy. The stomach contained about 4 ozs of fluid and the lungs contained no fluid.

The following is the history of the case as far as I can gather. He was a boatman by profession and was leading a quiet life, was not an alcoholic. He had been troubled with paroxysmal cough for the last two or three years. One day, he was rowing his canoe standing, and he fell into the river and was picked up dead.

CLINICAL NOTES ON FOUR CONSECUTIVE LARYNGEAL CASES

By F. D. BANA, M.B., M.R.C.S., D.P.H., D.T.M. & H.
(London)*Junior Hon. Surgeon J. J. Hospital Bombay*

In a large hospital clinic, such as that at the J. J. Hospital Ear, Nose and Throat Department, it often happens that there is a run of interesting cases. The following four laryngeal cases are of sufficient clinical interest to describe —

1. *Gumma of the Larynx*

The first of the series was a case of gumma of the larynx in a Hindu hawker aged 56. He complained of sore throat, hoarse voice and cough, could eat only with difficulty and pain but could drink liquids easily. There was slight dyspnoea as well. On examination with the laryngoscope a diffuse large red swelling could be seen on the posterior part of the larynx on the left side, swathed in yellow purulent discharge at the lower part of the pharynx and the commencement of the oesophagus. On mopping up the discharge and asking the patient to clear his throat the swelling, which was on the left arytenoid, showed a yellow ulcer of the size of a four-anna piece with a wash-leathery base and irregular margins. There were no enlarged glands in the neck. Inflammation extended to the opening of the oesophagus and left side of the larynx so that swallowing was difficult, and the infiltration of the vocal cords caused hoarseness. The duration of complaint was three months. Under potassium iodide mixture and gargles of potassium permanganate he improved rapidly, and at the end of a week his voice was beginning to get normal, he could eat solids better and had no dyspnoea. On examination at this stage there was a tiny ulcer with a yellow base. This completely disappeared in a fortnight's time, leaving a slight scar or puckering of the upper surface of the arytenoid, which was almost invisible except to the trained and observant eye. On inquiry into his history the patient admitted having had a chancre some twenty years before and showed a scar on the penis. The epitrochlear glands were also enlarged.

2. *Epithelioma of the Larynx*

A Parsi aged about 50 came from the Deccan for examination of his throat as he had lost his voice and could only speak in a whisper for the previous six months. He was a mechanical foreman in a factory and had to shout at the labourers under him, to which he attributed the gradual loss of his voice. He was treated by local doctors for six months with no benefit. On examination of his larynx there was found a papillomatous growth on the anterior commissure, encroaching on the anterior third of the cords, the size of a marble.

The base looked indurated and thickened. There was no ulceration. The glands in the anterior triangle were not distinctly enlarged but could be felt. This was evidently a case of intrinsic carcinoma of the larynx in which the glands are seldom affected earlier as with the extrinsic variety. There was slight dyspnoea, the patient was able to eat and drink well. He admitted to taking alcohol. He was advised to have an operation done as he was an early case but refused and left. There was no history of syphilis nor any signs of this disease. Subsequent to the examination he showed me various prescriptions of which one was of neosalvarsan, of which he had two injections with no benefit. This case therefore emphasizes the necessity of early examination and diagnosis of laryngeal trouble which does not readily yield to ordinary treatment. Unfortunately in this country patients are averse to taking expert opinion early, and even if they do are still more averse to taking surgical treatment when so advised.

3. *Case of Burn of the Mouth, Pharynx and Larynx by Caustic Soda*

A Hindu male, aged 26, a chemist's assistant, whilst drawing up a 15 per cent solution of caustic soda in a pipette for dilution with water, sucked up according to his description "three or four drops" of the caustic alkali into his mouth and throat on 18th June, 1923, at 11 A.M. He spat it out and gargled with plain water. He immediately applied to the hospital for treatment and was referred to the clinic for report. On examination the following appearances were noted —

There was tumefaction and oedematous swelling of the soft palate, the anterior pillars of the fauces, both tonsils, the middle of the oro-pharynx which could readily be seen by the tongue depressor. On laryngoscopic examination the swelling and tumefaction were seen on both sides of the epiglottis in its upper half, the base of the tongue anteriorly and the upper surfaces of the arytenoids and opening of the oesophagus. He was put on to saline gargles and inhalation of tinctura benzoinatæ in hot steam. Twenty-four hours later the appearance of the soft whitish burns turned to a red angry oedematous ulceration along the same structures. He was unable to take solids and could swallow milk or water only with great difficulty. Fortunately the burn did not extend to the glottis and the oedematous ulceration was limited to the epiglottis and the upper margins of the arytenoids only. Gargles of potassium permanganate were advised, within a week's time the ulceration and oedema subsided. He was able to take liquids first and semi-solid nourishment later. On the 29th he was discharged cured as the ulceration had subsided and the mucous membrane was covered with new epithelium from the margins.

4 A Case of Paralysis of the Left Vocal Cord

An old Hindu, aged 53, complained of hoarseness of the voice with cough and dyspnoea for the last month.

On examination of the larynx the left vocal cord and the structures on the left side of the larynx were noticed to be immobile. The right vocal cord and right arytenoid on the contrary were adducted very forcibly and seemed to cross over to the opposite on expiration and on efforts to speak. The paralysis of the left vocal cord was probably due to pressure on the left recurrent laryngeal nerve as it wound round the arch of the aorta. The patient gave a history of acquired syphilis and had the second aortic sound very much accentuated and had a water-hammer pulse, the knee jerks were absent and the Argyll-Robertson pupil reaction present. The pressure on the recurrent laryngeal nerve was due to its being involved probably in aortitis of the arch if not to an aneurysm of the same.

I have to thank Colonel Gordon Tucker M.B. (Lond) M.R.C.P. (Lond), Senior Medical Officer J.I. Hospital for permission to publish these notes.

AN ABNORMAL HERNIA

By D. W. ISAAC, L.M. & S., Asst. Surgeon
Churavunkil Travancore

In April 1923, I operated on a Hindu male, aged 39 admitted to hospital at midnight suffering from a strangulated left inguinal hernia. The swelling was peculiar in that it was mainly directed upwards towards the anterior superior iliac spine and that there was no testis in the left side of the scrotum. On opening the hernial sac the first object to come into view was a small mass which looked like an ovary with a long Fallopian tube some four inches in length. It was only as large as an ovary and did not resemble a testis with epididymis. It was intraperitoneal, completely covered with peritoneum and had no connection with the hernial sac. Examination showed that this mass was a rudimentary testis which had been retained—the mesorchium of foetal life having elongated and the rudimentary testis having been pushed into the hernial sac in front of the hernia by coils of intestine.

The rudimentary testis was returned to the abdomen together with the coils of intestine in the sac after dividing the constriction. The sac was separated from the abdominal wall and scrotum, and the usual operation for radical cure completed. The patient made an uninterrupted recovery.

The hernia was an old one of 18 years' duration and the patient had suffered from agonising pain with every movement of the limb. The right testis did not reach to the bottom of the scrotum, and was also small in size. Ex-

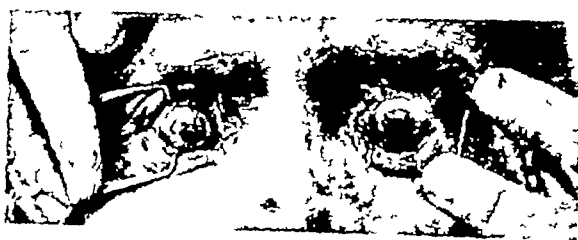
cept for a small penis, the patient was otherwise well developed and had two children. The abnormal features of the hernia were (1) its pointing towards the anterior superior iliac spine and (2) the inclusion within it of a rudimentary testis invested on all sides with peritoneum giving it the appearance of an ovary with a long pedicle of mesentery.

AN UNUSUAL SEQUEL OF TRACHOMA

By R. M. KAR, M.B.,

Mayurbhanj

SATYAN Hindumak, aged 28 cultivator, has been suffering for the last two years from itching of the eyelids, a feeling as of the presence of a foreign body and burning sensation in the eyes, lacrymation photophobia and congestion of both eyes later from dimness of vision gradually developed. There is a certain amount of ptosis of the upper eyelids and the palpebral apertures are distinctly small. The conjunctiva of both upper eyelids are trachomatous and the granules look large, flattened and greyish. The bulbar conjunctiva



of both eyes are slightly injected. In both eyes processes of bulbar conjunctiva are seen to invade the cornea from all sides. They are said to have started only last year and appear to be hypertrophied processes of conjunctiva arising at the limbus growing in centripetally completely encircling and gradually overlapping the cornea. The edges of these annular growths are irregular and not flush with the corneal surface. They are very clearly shown in the accompanying photograph. Iris healthy, pupillary reflex normal.

[NOTE.—The condition described might perhaps be one of spring catarrh or vernal conjunctivitis.—Ed., I.M.G.]

STONE IN THE NASAL CAVITY

By LALIT MOHAN CHAKRAVERTY, I.M.S.,

Chief Medical Officer Chanchal Raj Estate, Chanchal, Malda

BILATALI SHAIK, Mahomedan male, 38, came to the outdoor department of the I.C. Hospital Chanchal, on the 5th June, for the removal of a foreign body from his nose, which had been troubling him for a year or so.

Past history.—When he was a boy of about 10 or 12 years, he introduced a whole tamarind

seed in to his nose. Efforts were made to get it out, but it could not be removed. He believed that the seed had been there for some 28 years, though on questioning he admitted that he felt no uneasiness from it, no sneezing, pain, or discharge—in fact, no trouble.

Present condition—Right side of the nose much swollen, tender, discharging pus mixed with blood and of very foul odour. On inspection, a whitish-gray mass was seen almost completely blocking the right anterior nasal orifice. On being probed, it seemed to be a calcareous mass.

Operation—The mass was removed with forceps with difficulty, and whilst being removed, it broke into pieces exposing a cavity in the centre. The stone was $1\frac{1}{2}$ in long, 1 in broad and $\frac{1}{2}$ in thick and rough in appearance. The cavity was $\frac{3}{4}$ in long, $\frac{1}{2}$ in broad, of oval shape, containing some reddish brown debris. The stone weighed 150 grains.

Note—The shape and size of the cavity resemble very nearly those of a swollen tamarind seed and this corroborates the patient's history. But is it possible for a foreign body such as a tamarind seed, to remain dormant in the nasal passage without producing any trouble for so many years (about 27 years) and to become the focus for a stone formation? Again the debris in the cavity looked like a disintegrated blood clot. Is it not possible for a stone to grow round a blood clot?

The specimen has been preserved.

A CASE OF INGESTION OF HAIR BY AN INFANT, WITH SYMPTOMS SIMULATING DYSENTERY

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THE patient was a baby girl, aged 4 months, the child of Australian parents. I attended the confinement, from which date until now the baby had been absolutely healthy and was quite a prize specimen. She was breast-fed, except for one bottle of Lactogen per day.

Present illness The baby commenced having diarrhoea. On the first day she had seven stools and three stools during the night. The stools looked like "ordinary diarrhoea." On the second day she had 17 stools in the day and a further 8 at night. All these stools contained blood and mucus and also undigested milk. These stools were inoffensive. Microscopic examination showed no amœbæ or other pathogenic organisms. On the third day she passed a large offensive stool which also contained a large amount of blood. Later a second stool was passed containing blood and a strand of hair 7 inches long. The mother recognised the hair as belonging to her 4-year old daughter.

Altogether on the third day and night the baby passed 7 stools, and on the fourth day and night 4 stools, and on both these days the stools appeared normal.

During this period, and especially on the second day, the mother was very worried, but the baby appeared to be quite fit. There was no fretting, she slept well and took her food as usual. She strained at her stools however, but otherwise appeared to enjoy life as usual. This straining stopped once the hair was passed.

The only difference noted after this three days' ordeal was that there was some depression of the anterior fontanelle and the mother thought that the baby had "fallen away."

Current Topics.

British Empire Leprosy Relief Association.

LORD CHELMSFORD presided at a meeting at the India Office on July 12th, 1923, when it was decided to form a British Empire Leprosy Relief Association. A general committee was appointed, which includes the following, many of whom were present at the meeting—Lord Chelmsford, Lord Ronaldshay, Lord Riddell, Sir Humphry Rolleston, Sir William Leishman, Sir Havelock Charles, Sir Clifford Allbutt, Sir Archibald Garrod, Sir George Newman, Sir John Rose Bradford, Sir Walter Fletcher, Sir Malcolm Morris, Sir George Berry, M.P., Colonel F. E. Fremantle, M.P., Sir William Edwards, Sir Edward Gait, Member of Council, India Office, Sir William Vincent, Sir Charles McLeod, Sir Rajendranath Mookerjee, Sir Frank Carter, Sir James Michell, Sir Leonard Rogers, Professor J. W. W. Stephens, Lt-Colonel A. Alcock, Lt-Colonel S. P. James, Dr. Andrew Balfour, H. S. Wellcome, Esq., Dr. Cochrane and Mr. F. Oldrieve.

It was pointed out that the British Empire has more known lepers than any other political entity in the world, but is doing far less in proportion than is being done by the United States for its lepers. Less than 5 per cent of the sufferers in the King's dominions are being cared for in any way, and of these only a small proportion are receiving the recently improved treatment, mainly owing to the poverty of the countries most affected namely—India, Tropical Africa, and the West Indies. An executive committee and sub-committees were appointed to prepare plans for carrying out the objects of the association.

The Intravenous use of Anti-Pestueux Serum in Plague.

DR G. S. SAHASRABUDDHE writes from Poona strongly advocating the intravenous use of Yersin's serum in plague. "There has been plague with us for the last twenty-five years," he writes, "but there has not been much improvement in the treatment of plague." He notes Dr. Choksy as having been a strong advocate of the use of serum as long ago as 1909, and as having published statistics which showed an improvement of 57 per cent in the recovery rate after its use. He considered that it would usually have to be administered subcutaneously, since the ordinary practitioner had had but little experience of intravenous therapy, but times have changed since then, patients now clamour for injection treatments, and intravenous therapy is widely practised. Kitasato claims that the most effective measures for saving the patient's life are

serum therapy plus excision of the buboes at as early a stage as possible.

Dr Sahasrabudde's first experience of serum therapy in plague was some three or four years ago. The patient made a favourable recovery. In March 1923, having in hand a limited supply of Yersin's serum from the Pasteur Institute of Paris, he tried it in eight cases, and reports favourably on the results. The following are notes on the cases—

Case 1—Adult male. Inguinal bubo and temperature 103 degrees F. 60 c.c. of serum given intravenously, with the result that the patient had a rigor, and the temperature dropped to normal next morning. It then rose again and in two days time was 105 degrees. 6 c.c. were again given and the temperature dropped to 99 degrees. The next day it again rose to 105 degrees, and a further 60 c.c. were given. The temperature now dropped to 96 degrees with a rapid and running pulse of 140-150. Lobar pneumonia followed and the patient died on the ninth day of illness. (The result is claimed to be a recovery from plague, but death from subsequent pneumonia, but it is not stated whether *B. pestis* was present in the sputum or not.)

Case 2—Female child, 6 years old. No bubo could be felt, but the case was one of high fever unaffected by quinine, and on the morning after admission to hospital an enlarged and tender gland could be felt in the right axilla. 25 c.c. of serum were given intravenously in the evening. The temperature fell by next morning to almost normal, but again rose. No further serum was available at the time and the patient died on the third day of illness.

Case 3—Adult male, with a left inguinal bubo and a temperature of 105 degrees. 60 c.c. of serum was given intravenously on the day of admission, 60 c.c. intravenously and 40 c.c. subcutaneously on the second day, 50 c.c. intravenously and 50 c.c. subcutaneously on the third day, and diluted carbolic acid injected into the bubo. The temperature never dropped to normal, and the patient died on the fourth day of illness.

Case 4—Adult female. Here the diagnosis appears to have been a little doubtful. The patient gave a history of an abscess in the thigh some four years previously and when seen had high fever and a tender swelling in the middle of the right arm. Later there was swelling of the glands in the right axilla and of the right supratrochlear glands. The temperature rose to 105 degrees on one occasion, and plague was prevalent at the time. Delirium was present when first seen. The doses of anti-plague serum given were—25 c.c. subcutaneously on the third day, 30 c.c. subcutaneously on the sixth day, 25 c.c. subcutaneously on the ninth day, and the same dose on the eleventh day. The temperature now dropped to normal, but again rose on the sixteenth day with a further swelling of the right axillary glands. 25 c.c. were given subcutaneously on the seventeenth day and 30 c.c. on the nineteenth day. Fluctuation was now apparent in the axilla, and the patient was handed over to a surgeon. She made a sound recovery.

Case 5—Adult male. Fever with rigor and a right inguinal bubo. Doses given—50 c.c. intravenously on the second day followed by a drop of temperature from 102 degrees to normal and then recurrence of fever, 50 c.c. intravenously on the fourth day with the same result. 50 c.c. intravenously on the fifth day. The daily maximum of fever now did not exceed 100 degrees. On the tenth day a further 50 c.c. were given intravenously and carbolic acid injected into the bubo. The bubo subsequently suppurated and was incised. The patient made a good recovery. "Every time an injection was given the fever was brought down to normal within a few hours. Throughout the illness the pulse kept favourable in frequency and in tension. There was no delirium."

Case 6—Male adult. Fever with a right inguinal bubo. Serum given as follows—50 c.c. on the second day, after which the temperature became sub-normal, but then again rose. 50 c.c. on the third day, with a

subsequent fall of temperature from 103 degrees to 100 degrees. 50 c.c. on the fourth day when the temperature, which had risen to 104.8 degrees fell to 96 degrees. 50 c.c. on the seventh day and the same dose on the tenth day, all injections being intravenous. The bubo was incised on the thirteenth day, and the patient made a good recovery. There was no delirium and the pulse tension remained good throughout.

Case 7—Boy, inoculated with Haffkine's vaccine on 4th December 1922. attacked with plague on 26th March, 1923. temperature 106 degrees, sub-maxillary bubo, and delirium. 25 c.c. of serum given intravenously, but the patient died the next morning.

Case 8—Adult female. temperature 105 degrees pulse 135, left inguinal bubo. Intravenous injections of serum as follows—50 c.c. on the second day, followed by a drop of temperature to normal, and then a rise. 50 c.c. on the third day, followed by a drop from 104 degrees to 101 degrees, and then again a rise. 40 c.c. plus another 40 c.c. subcutaneously on the fourth day. 60 c.c. on the fifth day. 30 c.c. subcutaneously on the sixth day. The temperature gradually fell, the bubo did not suppurate, and she made a sound recovery.

The following table gives the results in summary—

Case No	Sex and Age	TOTAL DOSAGE OF SERUM GIVEN			Result
		Subcutaneous-ly	Intra-venous-ly	Total	
1	Male adult	0	180 c.c.	180 c.c.	Recovered from plague, but died from pneumonia
2	Female child	0	25 c.c.	25 c.c.	Died. Only one injection given
3	Male adult	90 c.c.	170 c.c.	260 c.c.	Died
4	Female adult	160 c.c.	25 c.c.	185 c.c.	Recovered. Had four buboes
5	Male adult	0	200 c.c.	200 c.c.	Recovered
6	Male adult	0	250 c.c.	250 c.c.	do
7	Male child	0	25 c.c.	25 c.c.	Died. Previously inoculated
8	Female adult	70 c.c.	200 c.c.	270 c.c.	Recovered

Dr Sahasrabudde can thus claim that four out of the eight cases recovered, whilst the first "recovered from plague, but died of subsequent pneumonia." He notes that in almost every instance the administration of the serum is followed by profuse sweating, often with diarrhoea, and that the temperature falls within from 4 to 10 hours, often to normal or sub-normal, though it usually again rises the next day. "It was almost like neutralising an acid with an alkali." A drop to normal after the first dose of serum was a point of good prognostic value, and was usually followed by recovery. The pulse under serum treatment keeps steady and strong. There is no delirium and the patient is at ease and not restless. The treatment "at least deserves further trial." With subcutaneous administration there may be a short rise of

temperature after injection, followed by the usual fall, but this is not seen with intravenous administration.

With these results before him he felt justified in lending 40 cc to a brother practitioner for trial, but he reported unusual sequelæ—the sudden onset of a running, thready pulse and cyanosis—the patient subsequently recovering after pituitrin, brandy and coffee. In a ninth case, noted on subsequently to writing his first notes, a female child of 12 with an inguinal bubo, was given intravenously 25 cc of the serum. Before the injection was completed restlessness and cyanosis set in and the pulse became impalpable,—apparently a case of anaphylaxis. The patient was brought round with pituitrin, strychnine, digitalis, camphor in oil, and hot water bottles, lived for four days, but then died. He notes that, although the reaction to the first injection of serum may be severe, and often with purging and sometimes vomiting, the reactions to subsequent doses become milder and milder. It is to be noted that the serum used in these last two cases had been obtained on the 30th March, 1923, and was used on the 10th and 11th of April. This serum was cloudy. In the first eight cases the serum was used perfectly fresh upon receipt and was clear.

Dr Sahasrabuddhe appeals for a further trial of Yersin's serum in plague cases and for reports on its use. He suggests that pituitrin or adrenalin might be added to the intravenous injections with benefit, and a preliminary cutaneous test for anaphylaxis might be carried out.

(The number of cases tried is of course, too small upon which to come to any definite conclusions. It may be remembered that the Indian Plague Commission tried, and was not favourably impressed with serum therapy.)—(Abstract from original communication.)

Some Notes on Framboesia.

THE number of the *Philippine Journal of Science* for March 1923, Vol 22, No 3 is almost a special one on framboesia. Drs E. W. Goodpasture and W. deLeon report on the effect of treatment on the Wassermann reaction in yaws. The test was strongly positive in all of 45 patients presenting active cutaneous lesions. The complement-binding strength of titrated serum from yaws cases was equal to the maximal strength of syphilitic serum. Following clinical cure after intravenous salvarsan the Wassermann reaction remained positive for many months, then gradually weakened, and became negative in 7 out of 12 cases within six months of treatment. Treatment of yaws in the early secondary stage with mercury caused no noticeable improvement in the lesions. The Wassermann reaction shewed a slight initial weakening, then remained strongly and constantly positive. An antigen prepared from any early yaw containing treponemata did not fix sera from yaws patients, which were strongly positive with the usual cholesterinised antigen.

Drs A. W. Sellards and Goodpasture discuss immunity in yaws. A patient in the well developed secondary stage of yaws was successfully re-inoculated with yaws but the lesion soon regressed spontaneously. Two patients in the stage of clavos were re-inoculated with yaws the lesions that resulted disappeared very rapidly. The re-inoculation of untreated cases suggests that a long-standing infection with yaws produces a definite but incomplete resistance to re-infection. Four patients in the secondary stage were treated with neosalvarsan and re-inoculated with yaws several months later. In one a typical granuloma resulted, in the other three atypical reactions followed. Here there is indication of a considerable degree of immunity in patients cured with neosalvarsan. No evidence was obtained however of any curative value in the serum of yaws cases under treatment with neosalvarsan.

Dr Sellards discusses yaws from the public health aspect. He considers that neosalvarsan can be safely used by medical men under proper precautions on an extensive scale. The diagnosis of granulomatous yaws is simple, but a Wassermann outfit is a valuable ad-

junct. Preliminary examination of the urine in cases of yaws before administering neosalvarsan is not necessary. The infectivity or otherwise of latent and of tertiary yaws has still to be fully determined. Further the introduction of some successful compound for intramuscular in place of intravenous use is desirable.

Dr Goodpasture discusses the histology of healing yaws. He shews that *T. pertenue* is demonstrable not only in the thickened epidermis in early yaws but also within the perivascular connective tissue of the papillæ. The lesions studied indicate that the secondary yaws begins with a localisation of the treponemata from the blood in certain papillæ, and that from such points, under favourable conditions, the treponemata invade the epidermis. Within 40 hours after the injection of a therapeutic dose of neosalvarsan all treponemata demonstrable by Levatidi's method have disappeared from early yaws. This very remarkable rapid healing consists of an almost immediate suppression of acute exudation, and removal of excessive fluid and cellular exudate by absorption and phagocytosis. Apparently neosalvarsan is destructive of polymorphonuclear leucocytes and this may favour the rapid disintegration of treponemata in the lesions. The older, secondary nodules have a more permanent architecture, heal less rapidly, and probably offer a greater protection to the treponemata. Here more care is required in effecting a complete cure.

Finally Drs Sellards and Goodpasture contribute a summary on the control of yaws. There is no disease whose treatment affords more immediate and more spectacular results. On the other hand there are few diseases which are so loathsome in appearance and mutilating in their results. Hence widespread treatment of yaws in clinics succeeds in arousing the co-operation of the public even in backward countries, and affords a useful means of bringing home to indigenous populations in even backward tropical countries the advantages of modern medicine. There is no surer road to bring home the advantages of modern therapy and public health to the unawakened.

The Etiology of Blackwater Fever.

In the *Annals of Tropical Medicine and Parasitology* for April 18th, 1923, Vol XVII, No 1, p 79 there appears an interesting article by Dr Blacklock on the subject of blackwater fever. After reviewing the current theories as to its causation, the author quotes a table of comparative symptoms of (a), symptomatic—including malarial—hæmoglobinuria, (b) toxic—including quinine—hæmoglobinuria, and (c) specific hæmoglobinuria, including blackwater fever and paroxysmal hæmoglobinuria. He considers, however, that the table is too dogmatic and that in the ultimate analysis, we have (a) the rarity of severe jaundice in malarial hæmoglobinuria, (b) in quinine hæmoglobinuria the relative lack of severity of symptoms and the fact that jaundice is absent or slight, whereas (c) in true blackwater severe jaundice is a marked symptom of the disease. The acute form of blackwater fever is a condition which it is easy enough to diagnose, but the transient hæmoglobinurias are to-day an outstanding puzzle.

The history is next given of a fatal case of blackwater fever. The patient had first two transient attacks of jaundice some weeks before the blackwater fever set in, and on the second occasion shewed subtertian malarial parasites in blood films. Finally he went down with a severe attack of blackwater fever which proved fatal on the ninth day. During the fatal attack the jaundice was only of slight degree. On the fourth day of the attack blood was taken from the patient into citrated saline and injected in two divided doses intramuscularly into the deltoid muscle of a volunteer. The recipient had previously had malaria, but had been free from relapse for over 18 months and had been off all quinine for over eight months. As a precaution against malarial infection from the injected blood the

recipient took 30 grains of quinine during the next 21 hours. The recipient remained in good health and free from hæmoglobinuria and shewed no blood parasites for the next two months.

Dr Blacklock argues that this experiment throws grave doubt upon the theory that blackwater fever is due to a specific organism, as such organism, if present, should have developed in the recipient. Further although 21 grains of quinine were given to the patient intramuscularly on the sixth and seventh days of illness this did not affect the temperature chart or the fatal issue.

He urges, in brief, that our present conception of blackwater fever is too narrow. Pre- and post-hæmoglobinuric states which are inherent parts of the disease are overlooked. In our present state of ignorance tropical hæmoglobinurias cannot be differentiated into malarial, quinine and specific blackwater types and neither the degree of jaundice nor the relative severity of the signs and symptoms will serve as a basis for differentiation. The more carefully transient hæmoglobinuria is looked for in the tropics,—and even in the temperate zones,—the more frequent is found to be the occurrence of such cases,—cases which may even be walking about with transient hæmoglobinuria and mild jaundice, without even being aware of the condition.

The Treatment of Burns

A SERIES of articles on the naval medical history of the war which is now appearing in the *Journal of the Royal Naval Medical Service* is one which is of special interest to military, as well as naval, medical officers. In the number for April 1923, p 120, Surgeon Rear Admiral J Chalmers deals with war burns and their treatment. A terrible description of the effects of primary and secondary ignition of cordite on H. M. S. *Lion* during the Jutland action is given. Of 206 cases of burns after the Jutland action 126 were due to flash from shell explosion and 80 to cordite ignition. Other causes of burns were the setting on fire of petrol and oil fuel and the bursting of steam pipes. Aeroplane warfare has added to the dangers of severe burns in action. The chief interest of the article however is in its analysis of the results with different lines of treatment. In dealing with the severe shock of grave burns morphia may be inevitable but should be withheld if possible. Hot baths at 80 degrees to 100 degrees F,—the patient being at once immersed in the bath with his clothes on,—are valuable. Saline injections should be given freely, and pituitrin is invaluable.

A long list of local remedies employed follows. Picric acid solution is useful, but only as a first dressing, not subsequently, and only for burns of the first and second degree. Its application is painful. The ambrine wax treatment, and the use of "No 7" paraffin after washing the burns with 1 in 1,000 flavine, were extensively tried. Although excellent for burns of the minor degrees, the author considers the wax treatments unsatisfactory for severe burns, and where sepsis is marked. A most valuable preparation was found in "Nikalgin," (Messrs Savory and Moore), of which the principal ingredients are urea and quinine. It is prepared as an ointment, also as a watery and as an oily solution. On direct application it has marked anæsthetic effects, and is antiseptic. The original ointment dressing can be painlessly removed by soaking the dressing again with the oily solution. No toxic effects were noted and the author strongly advocates the use of this preparation.

Of complications septicæmia must be treated in the usual way, and Dakin's hypochlorite solution was here found most useful. Scarring and contractures are often inevitable and here the author details the creasote-olive oil method used at the Hospital San Nicholas in Paris. A mixture of olive oil 15 parts and creasote 1 part, both purified, is made and from 5 to 10 minims injected at a time hypodermically and at frequent intervals into the scar tissue. The scars are

often rendered very pliable, and in Paris the method has given splendid results, not only in burns but also in cases of Dupuytren's contracture.

A Case of Eclampsia.

DR NARANJI M GHELLANI, Delvada Dispensary, Kathiawar, records an interesting case of eclampsia. The patient was a Hindu primipara, 25 years of age, and had been in labour for 48 hours when first seen. Eclampsia had set in, and matters had not been improved by the ministrations of two untrained dais, who had poured oil and saffron into the vagina. The os was dilated and a head presentation present, but two eclamptic fits had occurred and labour pains had ceased. On vaginal examination a third fit occurred. Quarter of a gram of morphia was given hypodermically, chloroform administered, and forceps sent for. Extract ergotæ liq had already been given, and when the patient recovered consciousness half a c. c. of pituitrin solution was given hypodermically. Eclamptic fits ensued in rapid succession, but the head was delivered spontaneously into the vagina, and a dead male foetus extracted by forceps application. An hour later the placenta followed. The perineum having been torn, sutures were applied. The parts were cleaned, and the patient put on to a fluid diet and an ergot mixture. The fits ceased with delivery.

For the first ten days of the puerperium the patient ran a temperature of from 99.4 degrees F to 101.4 degrees F. The urine was loaded with albumin, but by the thirteenth day there was only a trace, and albumin had completely disappeared on the sixteenth day. The case is of interest in view of the successful issue for the mother after protracted eclamptic labour, the absence of puerperal sepsis of any severity despite repeated early exposure to infection, and the sequelæ following pituitrin injection. Had the os uteri not been fully dilated considerable difficulties might have been encountered.—(Abstract from original communication)

Creasote Oil as a Mosquito-Repellent.

In the *U S A Public Health Report* for March the 9th, 1923, p 437, Dr C P Coogee comments on the results attained by the use of creasote oil sprays against mosquitoes. During a malaria survey of the Yazoo County, Miss it was found that some 99 per cent. of all mosquitoes encountered in this malarious area were *A quadrimaculatus*. The country is traversed by a railway raised upon a high embankment and a road running parallel with it, and the chief mosquito haunts were found to be under the culverts and arches of both, but in the case of the railway bridges, the timbers had been treated with creasote before being laid, and here mosquitoes were found to be far less abundant than under the road bridges. 25 houses in the district were now selected, of such construction that efficient anti-mosquito screening was impossible, and sample mosquito catches made and recorded. Three successive observations were made before creasote was applied and three afterwards per house. The treatment consisted of a generous application of crude creasote oil to walls and ceiling after removing all household effects into the sunlight. A 3 gallon pressure pump was used and about 2 gallons of creasote used per room. The cost was approximately 70 cents per room, but with a cheaper creasote at 15 cents per gallon it would not exceed 30 cents per room. Before the application the mosquito catches ranged from 3 to 89 per room, and most rooms shewed from 10 to 20. After the application no mosquitoes at all could be caught for two months or more during which the sprayed rooms were kept under observation.

The Prevention of Heart Disease and the Droplet Infection Menace.

DR POI VROV, whose name is so intimately associated with the discovery of the organism believed to be the

cause of acute rheumatism, recently delivered an important address on the prevention of heart disease. He laid special stress on instructing the general public in the nature of the disease and the necessity for great care in dealing with affected children. A copy of the leaflet of instructions which he suggests for issue by hospitals is as follows —

SPECIMEN OF INSTRUCTIONS

1 Rheumatism is caused by infection by a microbe and is a frequent disease in large cities

2 In children rheumatism often attacks the heart, and is the most frequent cause of organic heart disease

3 Pains in the muscles and joints in children should receive attention as possible warnings of rheumatism

4 Sore throats are often associated with acute rheumatism

5 Rheumatic heart disease is often painless and requires a doctor's examination for its detection. Shortness of breath and pain over the heart require immediate attention

6 The heart when injured by rheumatism recovers slowly from the poisoning, and one of the greatest dangers to a child's future is for it to resume an ordinary life before the heart is firm

7 Cholera or St Vitus's dance is rheumatism attacking the brain, and its chief danger is the tendency for the heart to be injured by the rheumatism at the same time

8 Great nervousness, dreaming of school work, alternation in disposition, and slight twitchings are often seen before the chorea has become definite, and are warnings

9 Rheumatism often recurs, especially in the spring and autumn

10 An occupation in life for a child with heart disease requires careful choice.

We advocate the attack on the disease at a still earlier stage by prevention rather than by amelioration. It is now fairly well established that the infection enters the upper air passages and presumably "droplet infection" or "sputum spray infection" forms the first chapter in the long story of this distressing ailment.

Rheumatic endocarditis, though not rare in India, is far less common than chronic bronchitis with emphysema which forms one of the great causes of invalidism and death in this country. In this disease as in many others the first incident is the contraction of infection of the air passages by the infected sputum spray from some infected person, then follows a succession of recrudescences and quiescences of the bronchitis over a long period. Emphysema gradually develops and finally the right side of the heart fails after a prolonged struggle to compensate for the damage to the pulmonary capillaries and the consequent increasing obstruction to the pulmonary arterial circulation. The details of the stories of many of the diseases which begin with sputum spray infection are imperfectly understood. Recently in the case of the great influenza pandemic there was a dramatic illustration of the possibilities connected with this form of infection, but even this terrible lesson has not been taken to heart.

Education in public health has done much to diminish the incidence of water borne and food borne infections, but in spite of the repeated warnings given by nature in the form of deaths from pneumonic plague, influenza, and other diseases we are still prepared to inhale the highly infective atmosphere of rooms occupied by persons who are coughing and sneezing countless microbes into the air.

Little hope of any great improvement in the death-rate from diseases which are due to respiratory infection can be hoped for until the medical profession and the general public are educated in the dangers attending on any form of infection of the air passages. In India it is usually easy to treat such patients in the open air, and it is now admitted that the patients themselves in such cases do much better in the open air, especially in cool or cold weather, whilst the risk

to attendants is infinitely less than when the sick are kept in closed rooms.

Veranda or open air treatment should be insisted on in all respiratory infections, except during the extreme heat of the hot weather days when fortunately such cases are much less common, and the risks of infection are smaller.

The convalescent patients, and all persons who have coughs should be strictly prohibited from occupying the rooms which other persons have to use.

Schools, offices, places of amusement and above all living and sleeping rooms are too often "exchanges of infection" and will continue to be so until the dangers of spray or droplet infection are realised and avoided. The general adoption of the principles advocated would not only cause a sudden drop in the incidence of colds, influenza, and other acute air borne infections, it would automatically solve many problems which are often regarded as mysteries, such as rheumatic infections and the vast majority of the cases of "asthma" in India.

The upper air passages of most people under existing conditions swarm with a variety of organisms which are merely 'lying low'. These are dangerous in two ways, under conditions of lowered resistance such as chill or debility they are liable to flare up and cause acute disease, and when any fresh infection is contracted, notably influenza, they light up and cause the complications which constitute the real danger in influenza. The medical profession must play its part in educating the public in the matter of droplet infection, its dangers and its prevention.

Lithium Chloride as a Mosquito Larvicide.

In the *Annals of Tropical Medicine and Parasitology* for the 18th of April, 1923, Vol XVII, No 1 p 9, Dr J W S Macfie details experiments with lithium chloride as a mosquito larvicide which will be of much interest to readers in India. The number of hours required to kill larvæ of *Stegomyia fasciata* in various solutions of chlorides were measured. 1 per cent, anhydrous lithium chloride killed all in 121 hours, the next best salt being NaCl which in 1 per cent, anhydrous solution killed all in 165 hours, and the worst BaCl which took 293 hours. 27 larvæ were placed in a 0.3 per cent solution of LiCl in the afternoon all were dead next morning, i.e., within 16 hours.

With larvæ of *Culex fatigans*,—5 larvæ placed in each jar containing, 100 c.c. of the solution,—0.015 and 0.03 per cent, LiCl solution had no effect but 0.06 per cent solution killed all in three days, and 0.15 per cent and 0.3 per cent solutions killed all within 12 to 24 hours. Also the lithium solution caused with both *stegomyia* and *culex* entanglement of the larvæ one with another by their mouth brushes and appeared to be very toxic to them. Further trials of the salt would certainly appear to be indicated.

"The New Midwifery."

MOTHERHOOD in all lands to-day owes and will one day recognise its debt to the late Dr J W Ballantyne of the Edinburgh Royal Maternity Hospital for his vigorous work in the inception in Great Britain of ante-natal clinics,—an example followed in America and Europe and fraught with the greatest possibilities of the saving of lives and the happiness and health of both mothers and children. In the *B M J* for the 14th April, 1923, p 617, will be found his address to the Nottingham Medico-Chirurgical Society on Jan 3rd, 1923, on "the new midwifery," an address which is to-day the last memento of his great work. The obstetrician of the past, he writes, went to his midwifery case determined, during the critical hours of birth to prevent, as far as in him lay, difficulties and danger to mother and child, and before he said farewell to his patients some two or three weeks later he endeavoured to repair, as far as he could, damage done

to either or both of them. The obstetrician of to-day needs to entertain a far different view to realise that the expectant mother should be the subject of his care and attention from the days of early pregnancy up to and after delivery that ante-natal supervision and treatment may be less dramatic than brilliant midwifery practised in an emergency, but that it is sounder and saner and more fruitful of successful results. The maternity hospital of to-day must recognise, he insists, that it is responsible, not only for the welfare of women in the hours of labour and in the days of the puerperium, but also in the months of pregnancy and in the time that immediately follows their departure from the institution. The pregnant, the parturient and the puerperal woman and her infant are no less the subjects of State care than the infectious fever patient, the tuberculous subject, and the insane and the school child.

The general practitioner, returned from the wars, has discovered with amazement that the purview of obstetrics has been changed that a whole new organisation has sprung up which cares for mother and child before and after labour that a new language is in vogue that he feels an outsider. Yet he cannot afford to ignore this movement, rather it is for him to enter into it and work in collaboration with it. And if he will only do so he will reap the benefit in easier labours, in dangers realised and prevented before they occur in syphilis and gonorrhœa for instance dealt with and cured before delivery, with healthy mother and healthy child in place of still births and infective deliveries.

If the new midwifery,—which, after all, is but a new view-point of old and well established principles,—is to be incorporated into the general body of medical practice it is necessary, not only that the general practitioner should get into touch with the ante-natal and similar agencies with regard to his poorer patients, but also that he should have his paying cases of midwifery under care and examination from their very inception. The examination of an expectant mother during the first few months of pregnancy should be as thorough as that of a male candidate for life insurance. Under present-day conditions of course, the State does not realise that such work,—making as it does for immensely improved figures in infant mortality and maternal death-rates,—should be adequately remunerated some day, however, the State may perhaps awake to its importance. By degrees the practitioner will find that under and post-graduate teaching may become part of his duties in this connection, that he links on to new public health activities and centres indeed he may herein find a remunerative field for practice as patients become more educated to the value of and the necessity for ante-natal care.

Turning to the benefits already reaped as a result of the new midwifery we must place first the removal of anxiety and dread from the minds of expectant, parturient and puerperal patients. However careless Nature may be in the matter, the expectant mother has a right to ask her medical attendant what steps he proposes to take to diminish the risk of death both to herself and to her infant. And this removal of anxiety not only applies to the expectant mother but also to the mother of three or four months standing when she leaves the clinic assured that all is well. Secondly we must place the removal of a vast amount of preventible pain and suffering. An enquiry into 500 parturient patients at the Edinburgh ante-natal clinic showed that 42 per cent. were fit, 51 per cent. suffered from minor ailments which were mostly preventible but which one and all regarded as a normal part of the burden of pregnancy, 6 per cent. were gravely incommenced or seriously ill. Thirdly there can be set no limits to the usefulness of such work in the diagnosis prevention and treatment of complications and diseases likely to render parturition dangerous or difficult. The percentage of normal labours is enormously increased indeed a

canny critic has already complained that the work of the ante-natal clinic is so lessening the number of cases of difficult labour and of obstetrical operations that the opportunities for teaching students such subjects are becoming seriously diminished. To take a few examples only, breech presentations are discovered before labour and converted into head presentations by external manipulation right and left-occipito-posterior presentations are changed to anterior positions by Buist's method of applying towel pads pelvic contractions are spotted early, in one case it may be safe to leave the birth to natural efforts and the moulding of the head in another induction a month before term may be indicated in a third Cæsarian section, even such minor points as the early discovery of twins and the necessity of providing two sets of baby clothes are not unimportant. In the new midwifery fewer obstetricians will return home wearied out after a strenuous engagement with forceps and it is comforting, not only to the patient, but also to her attendant to know that in all probability presenting part and brim of the pelvis are suited to one another and not at variance.

The still-birth rate for the whole of Edinburgh in 1921 was 478 per mille of births or—if venereal diseases be excluded—59 per mille. In the ante-natal clinic cases the still births only totalled 135 per mille among 816 ante-natally supervised pregnancies, including over 100 cases in which either syphilis or gonorrhœa or both were present. Finally we may place to the credit of the new midwifery a new confidence created in the public mind of the diminished risks of child birth and an increased willingness to propagate the race.

Clinical Aspects of Blood Loss in Labour

By DR PAUL T HARPER,

American J. of Obstetrics and Gynecology
March, 1923 Vol V, No 3, p 233

THIS paper is valuable in its sound and common-sense presentation of facts. The author first discusses the natural mechanism of control of blood loss in labour, mentioning such factors as compression of the tortuous uterine vessels in the firm, thick, contracting muscular wall, diminution in the size of the uterine cavity from contraction of the walls, and possibly increased coagulability of the blood and increased tendency to hæmostasis from lowered blood pressure following delivery. It is practically impossible to lay down any standard as to what constitutes excessive blood loss, so much depends upon the individual's condition and other factors.

If minor perineal injuries be excluded, postpartum hæmorrhage is the commonest complication of parturition. Of the causes of such hæmorrhage in actual practice the most common are—(a) Hour glass constriction of the uterus, with the detached placenta lying in the upper half and prevented from delivery by a ring of tonic contraction, (b) separation of a placenta lying in the lower half of the uterus, and (c) inertia or muscular insufficiency of the uterus. The last is probably the most important factor of the three and the cases of postpartum hæmorrhage which "come on" three or four hours after delivery and are attended with the passage of clots do not really come on at this time, but are cases where there has been continuous bleeding into the cavity of the uterus, without external hæmorrhage. The onset of this condition means no more than the conversion of concealed into open hæmorrhage. It is far more important for the attendant to keep a watch upon the size of the uterus and the height of the fundus than to practise massage of the fundus, a measure whose value is not always evident. External hæmorrhage and an increase in size of the uterus are to be looked for rather than a "soft and boggy uterus," which may not be felt until the patient is in extremis.

With regard to postpartum hæmorrhage prevention is better than cure. Throughout delivery it must be

remembered that the uterine muscle is becoming fatigued, and every permissible measure should be taken to prevent undue exhaustion of the uterine muscle. Thus a prolonged second stage may mean a prolonged "fourth stage" with much hæmorrhage. With the head well down and well moulded forceps delivery will conserve uterine energy. To allow the uterus to continue ineffective contractions is to incur a grave risk of postpartum hæmorrhage. A distended bladder or rectum may reflexly inhibit uterine contractions. Above all else of importance is a careful watch upon the uterus following delivery, "if blood clots were expressed from a moderately ballooned uterus an hour after delivery and firm contraction and retraction of the uterus secured, the possibility of an open hæmorrhage several hours later would be remote."

The administration of ergot or pituitrin to an exhausted uterus is like flogging a tired horse. Both are valuable aids to the control of postpartum hæmorrhage, but are useless when uterine energy has been exhausted. If the ordinary measures to control hæmorrhage are ineffectual the one measure of value is intra-uterine tamponade. We are accustomed to control hæmorrhage from an ulcerated surface by pressure, and here the principle is the same. Firm packing of the uterine cavity will control the hæmorrhage where nothing else will, and is a measure which should not be left till too late. Further the time to resort to intravenous saline is before shock has supervened and not after. The whole secret of the management of postpartum hæmorrhage lies in its prevention by attention to the second and third stages of labour, rather than a belated effort at its cure in the "fourth stage."

In a discussion of Dr Harper's paper Dr J Polak said that at Brooklyn during the last 1,000 deliveries the actual blood loss from the moment of birth of the child until the uterus had finally contracted down and all bleeding ceased was usually less than 250 cc some cases had as little loss as 30 cc others less than 100 cc. In only three cases had the loss exceeded 600 cc. In addition to shortening the second stage if the blood supply to the uterus were temporarily cut off by compression of the abdominal aorta it was often amazing to note how quickly a tired uterus recovered expelled clot and contracted down.

Pituitrin in the Second Stage of Labour.

In the *American JI of Obstetrics and Gynecology* for March, 1923, Vol V, No 3 pp 252 and 297, will be found an interesting paper by Dr Magnus A Tate upon this question together with a subsequent discussion by several leading American obstetricians. The author first deplored the tendency to publish isolated and random cases nothing but observation on considerable series was of value. The present day divergence of opinion on the value or danger of pituitrin during the second stage of labour was very marked.

He himself never uses doses of more than $\frac{1}{4}$ to $\frac{1}{2}$ c c., and repeats once if necessary, but never gives a total of more than one c c per patient. Used thus his experience was that pituitrin is an ideal adjunct. It is necessary however to note the well-marked contra-indications to its use, incomplete dilatation of the os non-engagement of the presenting part, any mechanical obstruction to delivery on the part of the pelvis, uterus, bladder, vagina or rectum or of the child, any disproportion of foetal or pelvic measurements, abnormal presentations, uterine inertia following a prolonged labour, and where the patient is very exhausted. But the drug cannot be condemned upon disasters following upon its improper use. Midwives ought never to be allowed to administer it. Used with due precautions however he considered that pituitrin in the second stage of labour ought to be a boon to motherhood.

The discussion which followed shewed that opinion was very far from unanimous. Dr Speidel said that from having once been an ardent advocate of pituitrin he had now become a very cautious and only occasional

user of the drug. If the first stage was too prolonged narcotics and a rest were indicated. If there was a second stage of prolonged and ineffective labour, direct manipulative methods should be resorted to, and constituted better practice than the resort to pituitrin with its attendant uncertainties and dangers. Dr G C Royston commented on the risks of tetanic contraction of the uterus with dangers of asphyxia to the child from the use of pituitrin in the second stage. Dr A P Leighton said that a knowledge of the patient's previous history was important especially with reference to a rheumatic or cardiac history, and quoted a case of an apparently healthy woman to whom he had given 4 minims of pituitrin during the second stage with the os three-quarters dilated and the presenting part well engaged. He turned round to put on gloves and apron, but heard deep breathing by the patient, and on turning back found that she was dead with mucus coming from the mouth. Pituitrin given to patients with myocardial degeneration was dangerous.

Dr S A Cosgrove considered that if Dr Tate's contra-indications were fully followed the number of cases requiring pituitrin in the second stage would be small and in such cases he preferred anaesthesia and mechanical delivery. Dr I K Quigley used small doses, 2 minims or so, and was entirely in favour of pituitrin administration in proper cases in the second stage. In summing up Dr Tate commented upon the cases where death was ascribed to pituitrin unjustly, e.g. a case of a primipara 13 hours in labour with no progress, where the midwife had given pituitrin and rupture of the uterus had followed. Here pituitrin was clearly contra-indicated. He noted the tendency of obstetricians to get up at meetings and denounce pituitrin, but to use it in their practice.

The Technique of Caesarian Section

By S J CAMERON, M B

*Proceedings Royal Society of Medicine, April 1923
Vol XVI, No 6, Section Obstetrics, p 50*

THIS paper will be of value to all who are called upon to carry out this operation. The author's record of 107 successive Caesarian sections in rachitic subjects has brought the death rate after Caesarian section in his practice down to less than one per cent, a very remarkable figure. The paper is full of details of great practical value.

The patient should, if possible, be operated upon before the onset of labour. Chloroform is the best anaesthetic. Theatre attendants and nurses should be especially warned against undue exposure of parts of the patient's body to exposure and chill on the operating table. The gravest complication of the operation is sepsis, and the author now performs craniotomy in most patients who have been subjected to repeated vaginal examinations and in all cases where the membranes have been ruptured for more than 12 hours.

The incision adopted is either a transverse one or one through the rectus sheath. The mid line should be avoided as here a vertical incision passes through weak structures, and hernia is apt to result. The incision should be on the right and not on the left side. Where Caesarian section has previously been performed on the same patient, with the contractions of the uterus the line of attachment of the former scar to the abdominal parietes can often be seen and avoided. It is unwise to make a second incision at the same site, as adhesions will have to be broken down, the operation will become unduly prolonged and death may occur from hæmorrhage or shock. The author's usual practice is to incise both the abdominal wall and the body of the uterus by transverse incisions. Cause should be placed between the parietal peritoneum and the uterus before the latter is opened, the author's practice being to insert four large swabs, two laterally and the other two at upper and lower angles of the abdominal wound. The same scalpel should not be used throughout a scalpel infected by incising the

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skin may carry sepsis to the uterus, and a fresh scalpel should always be taken for the uterine incision.

Once the uterus is opened the foetus is delivered as a breech. Immediately afterwards the uterus should be drawn through the parietal wound on to the abdominal wall, and the author's practice is then to turn the uterus inside out so that placenta and membranes can be readily stripped, using for this purpose a large pedget of gauze. Special attention should be paid to the membranes in the region of the cervix. The uterine body should then be sutured, not by mattress sutures, but by three large interrupted silk sutures, followed by interrupted catgut, followed again by a continuous catgut suture.

The author is not in favour of Frank's method of opening the uterus in its lower segment, but prefers a transverse incision near the fundus. If the lower uterine segment be opened the incision should be a longitudinal, and not a transverse one.

The abdomen having been closed in layers, the last step in the operation consists in examining the vagina in order to ascertain whether blood is escaping into the vagina or not. If there is any indication that the cervical canal is occluded by membranes the gloved finger should be inserted into the cervical canal. The abdominal dressing consists merely of a small gauze pad and the patient should be allowed every liberty of movement, being encouraged to sit up in bed in Fowler's position.

The discussion which followed Dr Cameron's paper was an interesting one. Several speakers dwelt upon the probable infant mortality resulting from so restricting the field of Caesarian section. Others considered that thick silk ligatures might and did wander from the uterine wall into the peritoneum and even ulcerate into other viscera. The position of spinal anaesthesia with regard to the operation was discussed, but opinion seemed to be far from unanimous. Dr Herbert Spencer quoted the following figures from the obstetric register at University College Hospital for the last three years—Total number of cases of labour, 5647; induction of premature labour 113, all the mothers and 102 children surviving; Caesarian sections 33 all the mothers and 30 children surviving; craniotomies 4, twice for hydrocephalus, twice for dead children.

Reviews.

THACKER'S INDIAN MEDICAL DIRECTORY, 1923, Messrs. Thacker, Spink and Co Calcutta 147 pp Price Rs 10.

This is the fifth issue of an annual publication which should be more widely known. The sections deal with the R.A.M.C., I.M.S., I.M.D., private practitioners, hospitals, chemists and druggists, nursing homes, nurses and midwives and medical missions. The names are arranged alphabetically under stations and districts, whose names are also arranged alphabetically in bold type so that ease of reference is facilitated. The book will be found exceedingly useful by any office which has a considerable volume of medical correspondence.

HOW TO IDENTIFY THE SNAKES, OF INDIA, INCLUDING BURMA AND CEYLON. By Colonel F. Wall, C.M.G., I.M.S. 56 pp with 70 illustrations. Obtainable from Colonel F. Wall, I.M.S., Sind Club, Karachi Price Rs 6-8 (including postage).

COLONEL WALL'S distinguished and outstanding authority in this subject, of which he has made a life-long study, give a very high value to this excellent book. The truly scientific method of classifying snakes should, of course, be by skeletal features but even to the skilled worker, and much more so to the

medical man and the student of biology, this is impracticable. Accordingly Colonel Wall adopts a method of classification by examination of the scale characters. Armed with a lens and a pair of finely pointed compasses with which to measure the relative length and breadth of shields, the reader is led in turn through the points of identification first of families, then of genera and finally of species. Everywhere detailed keys and a wealth of illustrations help the enquirer. Col. Wall writes that his book is mainly intended for those unacquainted with or but little acquainted with snake matters, but as he says, "it is probable that even those versed in ophiology will in many instances be saved laborious research through text-books, with these aids to identification at their side to consult—those who work in museums have too much work, and too little time in which to accomplish it, and even to them these keys and synopses may prove useful."

Colonel Wall's book is certain of a warm welcome in India, and we are privileged to be able to draw the attention of our readers to its publication.

THE ANTIQUITY OF DISEASE—By Dr. Roy L. Moodie. University of Chicago Press. Chicago, Ill 1923 148 pp. 36 Illustrations. 1-50 dols

No subject can interest the physician more than the antiquity of disease, and in Dr Moodie's little monograph he will find a most fascinating and authoritative contribution to this most interesting branch of medicine. Of the origin of the protozoa we know something, owing to a study of present-day forms of the origin of bacteria, however, we know little or nothing. And the study of paleopathology is rendered the more difficult because in fossilised mammals we have preserved only the bony skeleton, and not the soft parts. Indeed the science is one of the most recent, its beginnings dating from a first contributory paper by Esner of Erlangen in 1774.

Dr Moodie has for many years been engaged upon a special study of paleopathology and in this little handbook gives an admirable resumé for both the medical man and the layman. The illustrations alone render the volume one of special interest and value.

Prior to the evolution of disease, as such, he shows that commensalism probably led the way to parasitism. Bacteria date from the pre-Cambrian, probably from the Proterozoic age but the earliest bony lesions in ancient reptiles and mammals are of the nature of traumatic injuries, simple fractures and the like. In the Mesozoic we first find definite evidence of bacterial invasion, necrosis setting in at the site of bony injuries osteomata exostoses, dental caries—which appears to have worried the ancient vertebrates and reptiles as much as it does man of to-day. Still later we find evidences of death in opisthotonos, possibly due to bacterial disease osteomalacia and finally such relatively modern conditions as actinomycosis in a rhinoceros and spondylitis deformans in cave bears—a condition ascribed by some to syphilis, but almost certainly not due to this disease.

Coming to ancient man the author gives a fascinating account of ancient disease among the Incas, Peruvians and Egyptians. Trephining is one of the most ancient surgical processes, and was practised by Neolithic man 10,000 years ago. *Eoanthropus* shews a condition resembling acromegaly. Bartels has described a clear case of Pott's disease in a Neolithic skeleton of B.C. 7000 to 3000. The well known *tuberculum anomalum* on the 1st, 2nd and 3rd upper molars was of widespread occurrence in human dentition of the Neolithic and Paleolithic eras but was probably not syphilitic as stated by some authorities. Fatal arrow head injuries are frequently seen in remains of these eras.

Trephining was probably carried out by three or more different methods one process being to drill a series of holes around the piece of bone to be removed, another—and commoner—being to plane away the bone with a sharpened oyster shell, or later with special

copper or bronze instruments Ancient Peruvian skulls shew as many as three healed trephine holes, but it was apparently in Central Europe that the process first reached its most general use. Cauterisation of the skull has been found in ancient Peruvian skulls, the process having been so intense that ridges of callus formation have ensued. Amputation of fingers to propitiate the gods was an ancient and very common practice.

In ancient Egypt the evidences of ancient surgery are very clear. Copper, flint, ivory, and bone surgical instruments were common. Fractures were set,—often most unsuccessfully,—with splints. The aorta of King Merneptah 1225—1215 B. C., shews a typical picture of atheroma and senile calcification, and arteriosclerosis was apparently common, although syphilis and tobacco were unknown. A mummy of the 12th dynasty 1200—1100 B. C. shews what is apparently an eruption of variola. The calcified ova of *Schistosoma haematobium* have been found in mummies from the 12th dynasty onwards, and bilharziasis is of very ancient incidence in Egypt. Of other lesions in ancient mummies psoas abscess, pelvic osteosarcoma, spondylitis deformans and osteoporosis of the skull were not infrequent. In ancient Peru pottery of prehistoric date shews representations of espundia, and scoliosis and rheumatism appear to have affected the ancient ancestors of the Red Indians.

Dr Moodie's monograph is essentially readable and gives a remarkable picture of the illnesses of prehistoric creatures and of ancient man, of their causes and of prehistoric attempts at methods of cure.

ANNUAL REPORTS.

ANNUAL PUBLIC HEALTH REPORT FOR ASSAM, 1922

By LT-COLONEL T. C. McCOMBIE YOUNG, M.D.,
D.P.H., I.M.S.

Assam Govt Press, Shillong Price, 12 annas

COLONEL McCOMBIE YOUNG's annual report for 1922 is an able and extremely interesting document. As compared with the previous year there was a slight fall in the birth rate, 28.43 per mille as compared with 29.63 in 1921, and an average of 31.78 for the quinquennium 1916-20. Two factors, however, render comparison with previous years unreliable: the fact that the 1922 figures are based on the 1921 census returns, and the non-co-operation movement at the beginning of the year, which led to a breakdown in the registration of vital statistics. On tea estates, where this latter factor was not important, there was a satisfactory improvement in both birth and death rates. Importation of labour during the year was small and the statistics probably represent the favourable conditions of life amongst the old coolies and acclimatised labour settled on the estates. For tea gardens the birth rate, 27.13 per mille, was nearly 2 per 1000 higher than the death rate, 25.19 per mille, whereas for the whole Province the natural increase was only 1.58 per mille as against 3.15 in 1921.

Deaths totalled 184,057 and the death rate for the Province was 26.85 per mille. In Darrang the rate was 30.45, largely owing to an outbreak of cholera. An analysis of the causes for this rather high death rate in the Province is of interest. The first factor is undoubtedly infant mortality. This varied from a figure of 151.47 per 1000 births for the N. W. F. Province to 228.73 for the Central Provinces, Assam coming second on the list with a mortality of 198.20. As all Assam is rural the causes present in large cities are absent and it might be expected that Assam would shew better figures. The Director pleads for the establishment of child welfare centres in Assam, and in the covering Government resolution this matter receives attention.

The vaccination inspection staff made enquiries in certain urban areas as to the accuracy or otherwise

of the vital statistics recorded during the 12 months from Oct 1921 to Sept 1922, and an interesting table gives the results. The percentage of omissions varied in different areas from 1 to 33 per cent and totalled 7.78 per cent of births and 5.18 per cent of deaths not recorded. We wonder how and when some reliable system of registration of vital statistics is going to be introduced in India. "In Kamrup out of 1,837 entries checked, 447 omissions have been detected, which yields the percentage of 24.33 of the total number verified." The non-co-operation movement may have been partly responsible in 1921-1922 for this state of affairs, but, as pointed out by Major Russell for Madras, the registration of vital statistics for all India is still so defective that the figures are unreliable. In Assam during 1922 the policy of offering rewards to selected gaonburas for improvement of the accuracy of the vital statistics recorded in their areas was tried: the deputy commissioners of Kamrup and Nowgong think that this policy improved matters, the deputy commissioners of Darrang and Sibsagar, on the other hand, report no improvement. In this, as in all public health matters in India, it is difficult to know where to begin. The Director notes with pleasure the increased sense of responsibility shewn by many non-official chairmen of municipalities, but to-day there is not even a glimmer of a "public health conscience" in the land. Education of the public is the first essential step, but hitherto this has been conducted along the wrong lines. It is, or seems to be, a truism that an Indian taught how to avoid malaria will have a better prospect of life and a higher wage earning capacity than one who is left ignorant on such matters, yet the expenditure—even to-day—on such matters represents but an infinitesimal fraction of the public revenues, and the pedagogue still dominates the schools.

Turning to the chief diseases cholera was of some importance during the year. There were severe outbreaks in Darrang and Kamrup which were associated with a marked deficiency of the rainfall in the early months of the year and a consequent shortage of water-supply. The death rate from cholera was 2.36 per mille as against 2.25 for 1921. "It must give one pause to reflect," writes Colonel Young "that an annual toll of 2½ in every thousand persons is exacted by cholera, and that nothing whatsoever is done to prevent it." In 1922 no less than 16,219 persons died from cholera in Assam. "The appointment of rural health officers round which, as a nucleus, one had hoped that some simple preventive health organisation would grow has been swept away by the flood of retrenchment. These are not the times for constructive proposals. Maulvi Bazaar reported the highest ratio of cholera mortality, 5.99 per mille, and it is noteworthy that the conservancy arrangements of this town have for years been adversely criticised by this department." Experiments are in progress, we are informed with a new disinfectant, and if the claims made on its behalf are established, it should prove useful in checking outbreaks.

Influenza was fortunately of little importance during the year 1,597 deaths as against 3,170 in 1921. Smallpox prevailed in Nowgong and Goalpara. The reason was an influx of unvaccinated settlers from Bengal. As vaccination is not compulsory nothing can be done.

The death rate from fevers rose from 15.70 for 1921 to 16.35 per mille. Funds do not at present permit of any real anti-malarial campaign in Assam. An extremely interesting report is given of an anti-malarial investigation on a sugarcane farm in Kamrup which will be found on pp 476-479 of this issue. At Haflong despite unfavourable climatic conditions the continuance of the measures previously instituted has again resulted in a further reduction of malarial attacks. At Pasighat want of funds has reduced the previous anti-malarial programme and there has been an appreciable rise in malarial incidence among the garrison of the Assam Rifles. The unusual prevalence of malaria in Shillong has led to a special enquiry—now proceeding—with Major H. T. Shortt, I.M.S., in charge of it. Malaria in Assam—

perhaps the second most important disease in the Province—is as yet an untouched problem, owing as usual, to want of funds. If the tea export duty from Assam, which now goes to imperial revenues, went instead to provincial revenues, the problem could be tackled in real earnest.

The section dealing with kala-azar is, of course, the most important in the report. (We had hoped to have published this resume in the special kala-azar number of this journal for last July, but unfortunately Government sanction was withheld.) Unfortunately the hopes of 1921 have not entirely materialised. The disease has invaded Lakhimpur and the Upper Assam Valley which had hitherto been entirely free from this scourge. How it got there Heaven only knows. It is not an easterly extension from Sibsagar, where the infection has not spread more than 10 miles in 5 years. Further suspicions having been aroused, a kala-azar survey of Sylhet was undertaken under orders from the Minister for Public Health. The results were to shew an unexpected and unusual prevalence, especially in Habiganj and Karimganj. "The results of the survey will be of much interest to those who hold that malarial prevalence is probably not the only cause of the depopulation of rural areas in the Gangetic delta, and they fit in with the knowledge that is now coming to light regarding a similar prevalence of endemic kala-azar in certain Bengal districts." Some 6,000 cases were reported, and, whilst kala-azar is by no means epidemic in Sylhet, yet the district appears to be much more heavily infected than was previously recognised. The deaths from fever in this district have risen from 25,266 in 1914 to 43,088 in 1922. The fever rates for Cachar having raised suspicion, a kala-azar survey of this district is also being organised.

An apparatus for the aldehyde test was devised and issued to all kala-azar institutions and sub-assistant surgeons working in them. Three new dispensaries were opened in Darrang and Sylhet, whilst others, where the disease appeared to have ceased were closed as at Haflong. The proposals for the abolition of the post of Director of Public Health in Assam and for the reduction of the kala-azar staff which had been under consideration, and upon which both the *British Medical Journal* and the *Indian Medical Gazette* commented adversely in their editorial columns, were abandoned in view of the gravity of the situation, and instead a complete re-organisation of the anti-kala-azar work and staff in close co-operation with the Inspector-General of Hospitals was instituted. We cannot refrain from congratulating the Assam Administration upon the wisdom of this decision. They have given a lead to all India, to have abolished the appointment of Director of Public Health would have meant abandoning even the already existing and rudimentary beginnings of an efficient public health service for the whole country. The close of 1922 found the kala-azar situation in Assam even more difficult than it was previously, extensions of the disease into new and unexpected areas the need for a more vigorous in place of a reduced campaign. One essential problem, above all others, stands pre-eminent, the solution of the mystery as to how kala-azar spreads from man to man. We are delighted to learn from a recent communique that this has now been seriously undertaken, and, with the arrival of Lieut.-Colonel E. C. Hodgson M.S., as Director of the Pasteur Institute at Shillong, the services of Major H. E. Short, M.S. already an experienced worker at the problem, have been liberated for this enquiry.

Dysentery and diarrhoea still contribute an important proportion of the death rate, 149 per mille. There has however been a notable reduction, especially in the important tea districts of Lakhimpur Sibsagar and Darrang, and it is evident that the improvements introduced by tea garden managers, agents and medical officers are bearing fruit. The hookworm question in Assam still remains untackled, and is urgent. Here we would venture to support most strongly Colonel Young's appeal to the Rockefeller Foundation to

"come over and help us" not only is Assam a field of peculiar interest in the matter of ankylostomiasis, there is much original research work to be done in that Province on intestinal helminths, of which some flukes and possibly other entozoa are probably new and hitherto undescribed species. The intestinal parasites of the Province offer an exceptionally interesting field for study.

Of other matters of interest in Colonel Young's report mention may be made of the annual prevalence of typhoid fever in Shillong, and its special severity in 1922. The source of infection was traced to the milk supply, and over 50 cases occurred. Appropriate measures were taken and the results will be of interest. Enteric is endemic in the Khasi and Jaintia Hills and its extirpation is a difficult problem. Diphtheria has now been a constant source of anxiety in the boarding schools at Shillong since 1918, and an account is given of the introduction and use of the Schlick test—here used we believe for the first time in India, and its results and the immunisation of children found susceptible—an account which has already been published in our columns for September last. Financial considerations rendered it necessary to abolish the post of Public Health Engineer, and Mr. Shaw, Executive Engineer, kindly volunteered for and undertook the vacant duties in addition to his own without remuneration. Financial stringency prevented the suggested improvement of several water supplies and the suggested appointment of four rural health officers. The Public Health Laboratory examined 1,021 specimens, and notes that of 8 samples of mustard oil examined 4 were found to contain hydrocyanic acid. There were 25,062 immigrants into Assam during the year by different routes, but only 22 admissions to the Goalundo hospital, which caters for the tea coolie traffic, with no death.

Colonel Young is to be congratulated on this report. It is the record of a vigorous year of work, hampered only by the—inevitable—financial restrictions.

LAST INDIAN RAILWAY REPORT OF THE MEDICAL DEPARTMENT FOR THE FINANCIAL YEAR 1922-23

By H. G. WATERS, D.P.H., D.T.M. & H. (Cantab.),
Chief Medical Officer, E. I. Ry.

This report contains many items of interest. The railway staff concerned number 112,264, of whom 99,956 are working on the railway and 12,308 on the collieries including families, but excluding passengers, the total number of persons under medical care numbered 450,622 and 253,754 cases of sickness, scattered over a very wide area, were attended to by the 104 doctors employed by the railway.

At Moghal Serai considerable work had been done in the previous year in filling in tanks and depressions and other anti-malarial operations. The floods in August and September however brought all such work to a standstill, and the recurrence of this condition has been dealt with by improved surface drainage. There were 25 cases of plague, and in this connection Jubbulpore is an important focus. Dr. Waters points out that in the past 15 years year after year the railway has spent as much on temporary housing as an anti-plague measure to have provided proper quarters for the staff, who still have to live in the town, over and over again. The first aid measures taken in connection with the Rasulabad accident are mentioned, and at a meeting of heads of departments it was decided to provide sufficient first aid equipment for 12 cases on every engine—a fact which should be made known to medical men when travelling.

The nursing staff are reported to be doing excellent work, and it is noted that the Indian nurses, "after years of failure, are now proving a success." At Oak Grove School, where there is a total attendance of 8,058, figures have been compiled over the past five years establishing much needed standards of height, chest measurements, etc., for a healthy Anglo-Indian

school population. The work at the Allahabad clinical laboratory has become so onerous that an extension is urgently needed, but—as is usual in India to-day—this awaits the provision of funds. At Allahabad the attention of the Municipality was drawn to their discharge of crude sewage into the Jumna just above the intake of the railway supply, and it was decided to remove the sewage outlet to a point 100 yards below the pumping tanks. Here the filtered water supply is insufficient and intermittent, and the pumped supply liable to serious contamination. At Lillooah and Bamangachi flies constitute a serious nuisance, and this is ascribed mainly to the unsatisfactory conditions of night-soil trenching at Howrah. Railway medical officers are certainly to be sympathised with when their water supplies are liable to contamination from municipal sewage effluents and their sanitary zones at important stations to invasion by hosts of "sewage bred blue-bottles." The lesson is the need for co-operation between different departments.

Of the staff Dr. Pollock took the London D. P. H. during the year and Mr. Wade the Calcutta D. T. M. The Railway authorities have contributed liberally to the Calcutta School of Tropical Medicine and are now wisely arranging for their staff to attend in turn the post-graduate courses there on special study leave. Dr. Waters represented the Railway at the annual Indian Science Congress and read a paper on the relation of the third class passenger and the railway menial staff to the medical department.

Water supplies are most carefully watched on the railway. At Jamalpur and Bandel filtered supplies are installed. Food supplies at stations are noted as satisfactory. "Hospital improvements and extensions are held up, as is everything else, by lack of funds," and a well equipped 36 bed central hospital at Allahabad is urgently needed; it would be within 150 miles reach of all parts of the line except the Delhi-Umballa and Jubbulpore sections. Jamalpur, Dhanbad and Lillooah stand second in order of importance in provision of hospital facilities, but "the general well-being of our staff and dependents must await the provision of funds."

Two interesting examples of the value of properly organised public health work are given. At Moghal Sarai lakhs were being lost by sickness, chiefly malaria, and the problem was seriously tackled. In September 1920 the malaria incidence reached no less than 23 per cent of the total strength of staff employed. Tanks and hollows were dealt with and within 8 weeks immense improvement resulted. Monsoon flooding however put a stop to all such measures and the engineers were called in. The cutting of drains at a cost of Rs. 70,000 lowered the surface water by 3 feet 9 inches, and the station is now healthy. At Gujhandi the malaria incidence reached 41 per cent of the staff employed in November 1920, and blood films showed severe, mixed and multiple infections. Starting from the lower end of the settlement 6 feet to 8 feet drains were put in and showed that subsoil springs were present. Open brick drains were next put at the bottom of these trenches and the earth filled in. As a result there has been a general drying up of the ground and—as soon as possession can be obtained of a small patch of land in the middle of the settlement which is needed to complete the subsoil drainage system—Gujhandi should become a healthy settlement.

With regard to the St. John Ambulance the number of certificate holders on the staff has increased to 860 Europeans and 472 Indians. The second team from Jamalpur won the Auxiliary Force Shield and the All-India Labour Shield was won by a team from the Lillooah Workshops. One in every three of the European railway staff is thus qualified to deal with first aid accident and medical emergencies.

Dr. Waters' report shows how well organised and efficient is the medical service in connection with the E. I. Railway, and he is to be complimented on an

interesting account of the results accomplished and the difficulties encountered in this branch of medical work.

NOTE ON THE LUNATIC ASYLUMS IN BURMA FOR THE YEAR 1922

Rangoon. Supdt. Govt. Printing, Burma. Price, Rs. 1

THE two asylums in Burma are the Rangoon Asylum, with accommodation for 632 inmates, and the Minbu Asylum with accommodation for 125. The latter was never overcrowded during the year, but in the Rangoon Asylum the daily average was 632, 523 males and 109 females. The new asylum at Tagdale is now partially completed, it is hoped to transfer 170 quiet male inmates to it, and this may partly relieve the overcrowding in the Rangoon Asylum. With regard to other projects the Executive Engineer reports that the policy of only allotting an annual grant of 2 to 3 lakhs is holding matters up and strongly urges a substantial grant in the near future in order to effect both ultimate economy and greater progress.

The Rangoon Asylum admitted 225 cases during the year, 197 males and 28 females. There were 99 discharges, 59 cured and 32 improved, 8 otherwise. The general health was satisfactory, the daily average sick being 149 as against 152 the previous year, and the percentage of mortality to daily average strength being 7.74. Of five deaths within a year of admission three were admitted in a poor state of health. No change was made in the scale of diets during the year, but, whilst keeping within the authorised cost the diets were varied as far as possible. The cost of diet was, on an average, Rs. 102 per head in Rangoon, and Rs. 76 per head at Minbu per annum.

Enquiries into incidence of lunacy revealed no special differences in different parts of Burma. There was a large and continued increase in the number of cases of insanity attributed to drugs, the figures having gone up from 33 in 1921 to 54 in 1922, and the increase being attributed chiefly to alcohol and *Cannabis indica*. The total expenditure on both asylums in the year was Rs. 3,24,539 as against Rs. 3,17,728 in 1921. An innovation was introduced by the payment of monetary rewards to those who shewed diligence in the work given—rewards which were expended in the purchase by them of goods appreciated by them from the Rangoon Asylum bazaar at cost price.

ANNUAL REPORT OF THE CHEMICAL EXAMINERS DEPARTMENT BENGAL FOR 1922

Calcutta. Bengal Secretariat Book Dept. Price 12 annas

THIS report shows a considerable increase in the volume of work for 1922 as compared with that of the previous year, partly due to the fact that the preliminary examination of blood-stained articles for the detection of blood is now carried out by this Department—only cases requiring report on the character of the blood concerned being forwarded to the Imperial Serologist's Department, and partly to an increase in the general section especially in the number of samples of cocaine received for analysis. Major T. C. Boyd, I.M.S., was in charge, except during the period from 5th May to 4th October when Assistant Surgeon Hiralal Sinha, B.A., I.M.S., held charge.

In the General Department 1,332 examinations were made as against 929 in 1921. Of 8 samples of ghee 4 were found to be adulterated. 876 samples of cocaine were examined, and many showed adulteration. Opinions were asked for on such varying subjects as the danger of spontaneous combustion of samples of turpentine used in the Survey of India Map Office, the suitability or otherwise of classifying English benzol admitted to Calcutta Port as explosives or petrol, the toxicity of samples of novarsenobillon, the effects of storage on ether, the possibility of purification of old samples of glycerine, the preparation of pH sets, and

the testing of samples of carbon tetrachloride for anthelmintic use.

In the Medico-Legal Department 2,961 articles were examined as against 2,212 in the previous year, only 56 per cent of which came from Bengal. Of 642 specimens of human viscera sent for analysis the medical officers concerned could not give the cause of death in 157, and in 32 per cent of these poison was detected. In the case of viscera of horned cattle poison was detected in 50 out of 114 specimens submitted, arsenic, aconite, and oleander being the poisons most commonly employed. A curious case is that of a cow accidentally poisoned with arsenic from spraying with a tick-destroying fluid and another that of a goat which died from arsenical poisoning as the result of licking a paint applied to the posts of a building for the prevention of white ants.

In the cases of human poisoning curious instances are one of a woman who was apparently drugged with atropine as a preliminary to having her throat cut, a case of HCN poisoning in a workman in a paint shop, an instance where a khalasi of the B N Ry found a bottle of what he thought was brandy in a goods shed, and with eight of his friends partook of the contents. All shewed symptoms of aconite poisoning and one died. The body of a Hindu male was found in a temple at Puri, the penis appeared to have been amputated some time previously and death was due to nux vomica seed poisoning. Country *pachai* liquor is apparently frequently adulterated with aconite in order to increase the thirst of the drinkers, whilst a case of salicylic acid poisoning in a European constitutes a curiosity in this country.

In addition to its own proper duties the officers of the Department delivered the courses of lectures in chemistry to the students of the Calcutta Medical College, and the official chart of poisons and antidotes was revised before its reprint.

GOVERNMENT OF MADRAS LOCAL SELF-GOVERNMENT DEPARTMENT

Public Health Chemical Examiner, Madras Annual Report 1922 G O No 688 P H dated 21st April 1923

This report, by Major Clive Newcomb M.D. A.I.C., I.M.S., contains much of interest. The total examinations conducted numbered 3,824 as against a general average of 3,599 for the previous five years. A careful examination of the poisoning and blood-stain cases received during the last ten years shewed little if any seasonal variation, and there appears to be no special murder season in Madras.

Of 220 cases of suspected human poisoning 108 shewed poison. In the extraction of morphine from viscera the porphyroxin test, recommended by Lucas in his Forensic Chemistry, was tried and was found to be more delicate than other methods. Beam's test for *Cannabis indica* was found to be reliable, Dr S Rajagopal Navudu devised a test for *madar* and the quinine molybdate test for arsenic was found to work well.

An interesting case recorded is that of a young man who fell down dead on hearing suddenly of his mother's death. No poison could be detected in the viscera. Of 175 persons poisoned 74 died, and in the 108 instances concerned mercury was the poison most commonly found (32 cases), arsenic next (23 cases), and opium third (19 cases). A young man of 24, out of work brought one ounce of tinct. iodi and drank it, but recovered, in the case of a small girl of 10 accidentally poisoned by juice of nux vomica leaves, strychnine and brucine were readily extracted from the leaves concerned, but none could be found in the stomach, and in such cases apparently, if the patient lives long enough, the alkaloids may be found in the organs but not in the stomach contents having been absorbed. A husband and wife having taken a fatal dose of cyanide both survived for some 40 minutes, and neither vomiting nor purging were present. A

child of four swallowed a fatal dose of "phenyl", a man murdered his wife by throwing a saturated solution of caustic soda over her, death occurring on the 16th day. Curry was used as a vehicle for poisoning by copper salts, whilst an ingenious thief hired a *jutka*, rendered the driver drowsy by *dhatura* administered in food, and then attempted to steal the horse and cart. The intelligent horse however refused to take any road other than that for home, bystanders came to help and discovered the driver in an unconscious state and the thief was arrested.

In connection with stain cases the spectroscopic is generally used in examining for human blood, supplemented by other tests where necessary. In routine examination for seminal stains Florence's test has been subjected to full trial and a modification worked out which gives improved results. The suspected stain is cut out and wetted with sufficient distilled water to give a drop when the cloth is squeezed. To this drop on a microscope slide—the water and cloth having remained in contact for not less than five minutes—a drop of a saturated solution of iodine in 10 per cent potass iodide is placed adjacent, but not touching it. A cover slip is then inverted on the two drops, which now mingle, and the junction is examined under a magnification of about $\times 80$ diameters, e.g., low power. If semen is present a crop of Florence's crystals is seen or soon appears. The high power is then turned on and the fluid searched for spermatozoa. The substance which gives the test is apparently choline and in view of the wide distribution of choline in animal and plant tissues the test has a greater negative than positive value. On the other hand, choline usually occurs in other tissues in combination, chiefly as lecithin, and in practice the test is often very useful in indicating the necessity for a careful search for spermatozoa. Of miscellaneous medico-legal cases Major Newcomb notes on the difficulty of attempting to estimate even height from long bones submitted, it is not likely that the result will be accurate to within more than three inches. A woman was found murdered and grasped in her hand was a tuft of hair. A man was arrested and samples of his hair sent for comparison with that of the tuft in the dead woman's hand. Both were curly, and as curliness is associated with cross section, cross sections of both samples were mounted and measured. No difference could be found.

In gastric analysis work for the General Hospital pH solutions are being prepared. An instance of the untrustworthiness of labels was given by a bottle labelled "Pure Saccharose" which on analysis was found to contain a considerable amount of glucose. Whilst a method has been devised of estimating the amount of alcohol in chloroform by washing and testing the density before and after. Experiments in connection with this important matter are still in hand.

Correspondence.

PLASMODIUM TENUE AND P OVALE
To the Editor of THE INDIAN MEDICAL GAZETTE

SIR,—*Plasmodium tenue* is undoubtedly dead, though Sinton recently made a gallant attempt to resuscitate it. But the cause of death is a mysterious affair. Most authorities attribute it to heat stroke, frizzled to death on a "hot slide," but the latest authority (I M G June, 1923), thinks it was nothing of the sort, but on the contrary, a kind of dropsy drowned in "unusual humidity," or at any rate it occurred somehow.

P. ovale also if not actually dead is undoubtedly moribund and here too the syndrome presents mysterious features. One authority thinks it may be an old "sport," while the latest authority still more insultingly believes it is a congenital malformation, in simpler language "a distortion."

Tenuis! with your frail constitution, little hope was held of your reaching adolescence, but

Ovale! with your fat little quartan-like body deformed from birth, so pleasant to behold in your Schüffner-stippled cradle, I had contemplated for you a longer life, but now you too, frozen to the marrow by the cold douche from the critical taps are at death's door. May ye rest in peace. Ye will lie amidst a distinguished crowd.

For dead also are *Piroplasma bigeminum*, *Trypanosoma brucei*, *Leishmania donovani*, and many others, all slain by the latest authority, who has ruled that no self-respecting parasite should commit the indecency of birth, if it cannot secure for the occasion a bath of hæmatoxylin and a pedigree!

Yours, etc.,

J W W STEPHENS,

M.D., F.R.S.

LIVERPOOL SCHOOL OF TROPICAL MEDICINE

10th July 1923

P S.—In my original description of *Plasmodium ovale* I unfortunately overlooked the fact that this species has apparently already been figured by Macfie and Ingram from West Africa in 1917, and apparently also by Christophers and myself from the same locality as far back as 1900.

To the Editor of THE INDIAN MEDICAL GAZETTE

SIR,—I have read Professor Stephens' witty and caustic letter with much amusement. As I am the person in question guilty of the tremendous indiscretion of venturing to criticise *Plasmodium ovale* and *Plasmodium tenuis*, perhaps you will, of your courtesy, permit me to reply.

In the first place there is no question of authority, of course. The writer is nothing more than a humble and admiring student of those celestial beings in a terrestrial environment—the protozoa—and the note was signed to shew that the opinions expressed were merely those of an individual worker. Professor Stephens had announced for the second time in his distinguished career, the discovery of a new malarial parasite of man, and the matter appeared to the writer to be too important to pass over without note and comment in your columns. In doing so he attempted to sift the evidence for and against the discovery, and to do so within brief limits.

Taking *Plasmodium ovale* first, as the literature is here less complicated, the claims for this new species rest upon Stephens' 1922 paper and its beautiful coloured plate. The parasite was seen in one case only. The temperature chart was an irregular one, but shewed a definite tendency to tertian periodicity, whilst the schizogony cycle of the parasite occupied approximately 48 hours. Under such circumstances one would have expected blood films to shew either *P. vivax* or *P. falciparum* and we read "Now and then, but it has been a rare occurrence I have encountered a form which I could not distinguish from simple tertian." Is it not a legitimate inference from this to consider that scanty infection with *P. vivax* was present in the case?

P. ovale in the colour plate, however, resembles *P. malariae* far more closely than it resembles *P. vivax*. The rings shewed "no indication of amœboid activity as judged by irregularity of form." The medium sized trophozoites were "non-amœboid, pigmented, compact, round or oval parasites, resembling quartan" in red blood corpuscles which were normal in size or only slightly enlarged, and many of the infected erythrocytes, though not all—(e.g. figure 18 of the plate)—shewed Schüffner's dots. "The pigment appeared to be brownish black and granular rather than spicular. The maximum number of segments (merozoites) appears to be 12." Gametocytes were not encountered.

These findings are admittedly puzzling, but do they warrant the creation of a new species? The presence of Schüffner's dots is the principal argument against writing down these forms as *P. malariae*, figures

7, 8, 9 and 10 would almost certainly be labelled "Quartan" were it not for these dots. Cragg and Naidu (1918) have drawn attention to the way in which atypical parasites tend to occur in cases where successive attacks of fever over a long period have reduced the patient's vitality to a serious degree. Had Dr Stephens published his paper in order to call attention to certain puzzling findings which might suggest the existence of a new malarial parasite of man, hitherto undiscovered, the paper would have been a valuable contribution to a most difficult subject. There is an *ex-cathedra* flavour about *Plasmodium ovale*, however, which the above letter does nothing to remove. Will not simultaneous and long standing mixed infection with *P. vivax* and *P. malariae* in a debilitated patient explain the findings? Are the grounds sufficient for the creation of a new species?

Plasmodium tenuis Stephens, 1914, is an older and an even more difficult subject. Here again the new species was created on the strength of findings from only one patient—in this instance from a single blood film, posted from the Central Provinces to Liverpool. The main points of difference from the rings of *P. falciparum* were that the new parasite was extremely amœboid, the cytoplasm always scanty, the nuclear chromatin out of all proportion to the amount of cytoplasm present and present in the most bizarre and pleomorphic patterns. Plate X of the article affords a beautiful colour sketch of the appearances seen. This film was received in the autumn of 1913. In 1914—(Stephens, 1915, p. 171)—the same patient was re-examined, two films in March, 1914, shewed quartan infection and in one of the films a single parasite resembling *P. vivax* was encountered, three films in June and one in July shewed quartan parasites. It is clear therefore that the child from whom these films came was subject to infection with two or even three species of malarial parasites.

On the controversy that followed the publication of Stephens' paper in 1914, considerations of space do not permit me to dwell. Two alternative solutions to the creation of a new species appear to be permissible, either that the case was one of mixed infection with *P. vivax* and *P. falciparum*, or else that under certain circumstances, as pointed out by Balfour and Wenyon, 1914 (and especially during acute epidemics), *P. falciparum* may assume unusual amœboid activity. "Dr Stephens has named such an amœboid form seen by him in a single blood film *P. tenuis*, but has not produced any evidence to prove that he was not dealing with an amœboid sub-tertian parasite. It is unfortunate that in his film there existed only the single stage—neither schizonts nor crescents being present to help in the diagnosis." And their paper is illustrated by two coloured plates, one of which—Plate II—shews forms identical with those in Plate X of the article by Stephens (1914). Stephens (1915) counters this by claiming that Balfour and Wenyon's Plate II figures forms almost certainly identical with *P. tenuis*, but here we have what must be admitted to be high authoritative opinion set against high authoritative opinion, and the additional information that, whatever be the nature of *P. tenuis* it produces crescentic gametocytes which closely resemble those of *P. falciparum*. Of the clinical features of the case from which *P. tenuis* was originally described and of the periodicity of the fever, no information is vouchsafed to the enquirer.

One asks again—"Is this sufficient evidence upon which to create a new species of malarial parasite?"

Turning to Major Sinton's work—(Sinton 1922)—thanks to the very great kindness of Major Sinton the writer was given an opportunity of seeing his original slides and beautiful plates. Major Sinton has seen *P. tenuis* infection first in the five cases in the Central Provinces mentioned in his 1922 paper, still later in other cases at Lahore and recently, in a personal communication he writes that he is more than ever convinced that *P. tenuis* is a different species from *P. falciparum*. Admitting that *P. tenuis* has crescentic gametocytes, this fact at once differentiates it from *P. vivax*.

and *P. malariae*. From *P. falciparum* Sinton claims that the new parasite is to be differentiated by the following points—(1) "The smallest ring forms seen were never less than 1/5th the diameter of the infected cell, whilst in *P. falciparum* infections forms as small as 1/7th are described (2) In these small forms the chromatin dot does not appear to project as much externally as in the similar stages of *P. falciparum* (3) The very varied forms of the *P. tenuis* stage differ very much from the pseudopodial forms of *P. falciparum* (4) The irregularity and abundance of the chromatin differ from the more or less compact form seen in *P. falciparum* (5) The largest sizes of *P. tenuis* seen in the peripheral blood were about half the diameter of the infected cell, whereas Stephens and Christophers give the size of the largest peripheral blood forms of *P. falciparum* as 1/4 to 1/3rd (6) *Accolite* forms seem rarer than in the early stages of *P. falciparum*" And with regard to the infected red cell he notes—(1) "The slight enlargement during the *tenuis* stage (2) Crenation and distortion of the cell are rarely seen until the parasite is about 32 hours old (3) The malignant stippling appears to be of a more rounded character and more numerous than that seen in *P. falciparum*" Finally hemozoin pigment appears later and seems to be of a lighter colour than that seen in *P. falciparum* parasites as old as 36 hours of age are to be encountered in the peripheral blood and clinically the disease is of very mild type for infection with *P. falciparum*.

Every one of these points—(except the last, concerning which he has of course no knowledge)—the writer admits. They are very clearly demonstrated in Major Sinton's preparations and sketches. But will not either mixed infection with *P. vivax* and *P. falciparum* or an unusually amoeboid state of *P. falciparum* explain them? Plate III, figure 7, of Major Sinton's paper certainly suggests an infection with the benign tertian parasite. Are these findings sufficient upon which to base a claim for the existence of a new species of malarial parasite? Finally Major Sinton considers that *P. tenuis* closely resembles *P. unimaculatum* (Grassi and Faletti) but has tertian and not quotidian periodicity and that therefore the separate existence of the latter species requires re-consideration.

Where—amid all this confusion—is the ordinary medical practitioner or the medical student to take his stand? Briefly he pays his money—in the form of subscriptions to journals—and may take his choice. He may either believe—(1) that all malarial parasites belong to one and the same species. This view is maintained chiefly by certain eminent French workers. The evidence which they bring forward is largely epidemiological and not very convincing (2) In addition to the three (almost) universally admitted species *P. vivax*, *P. malariae* and *P. falciparum* (and *L. coccidiophila*), he may admit *P. tenuis*, *P. praecox*, *P. unimaculatum*, *P. falciparum* quotidianum, *P. ovale*, and *hac species omne* but he will find it difficult to know where to draw the line. Also with regard to these new parasites, with what periodicity of fever are they respectively associated? With regard to at least two of them what are their gametocytes like. And with regard to all of them what are their sporogony cycles like and how do they differ in this respect from the (almost) universally admitted trio? Or (3) he may adopt a conservative view as does the writer, recognise the three (almost) universally admitted species, *P. vivax*, *P. malariae* and *P. falciparum* admit that there may perhaps be other species, which however, will require the fullest possible proof of their separate existence, their distinguishing features and their complete life cycles, before they can be generally accepted.

In this matter Sir we have a serious precedent. From the days when Lewis and Cunningham in 1870 discovered *Entamoeba coli* and Grassi called it *Amoeba coli* and Loesch in 1875 discovered *Entamoeba histolytica* and called it also *Amoeba coli* down to 1916, the literature on the entamoeba of man is confusion worse confounded. The writer regrets to say that possibly he may have

added to this confusion, and, in the matter of introduction of new species of protozoa, he writes as one who has learnt by experience a most useful and necessary lesson. Then came the war work of Wenyon and O'Connor, of others, and—above all—of Dobell. Finally came the publication in 1919 of Dobell's splendid monograph upon the "Amoebae living in Man," which crystallized and set upon sure foundations our knowledge of these parasites. There may exist more than the six species of human entamoebae described by Dobell, but so far not one of them has as yet been properly described, identified, set upon sure and certain foundations, and universally recognised and accepted.

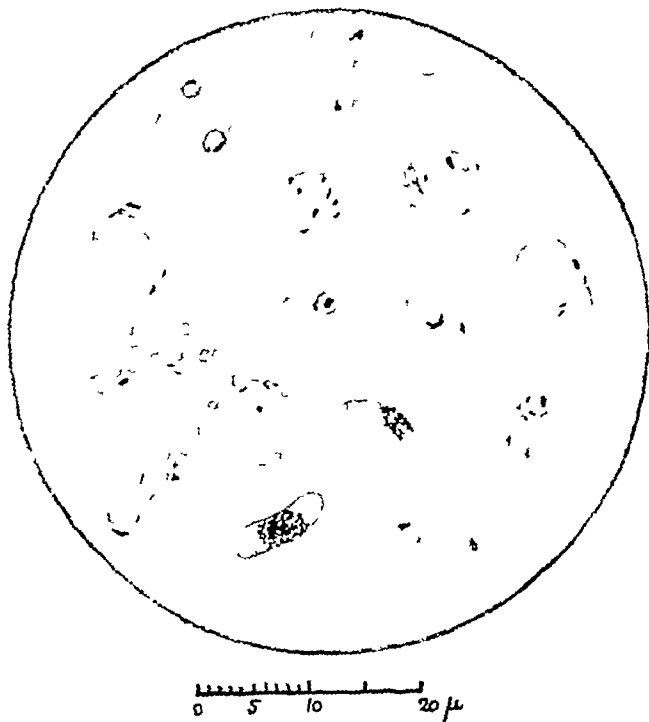
The literature upon the intestinal flagellate protozoa of man is at present passing into the same condition of incredible confusion. New species are constantly being described upon the most slender basis of observation, the most dogmatic assertions as to pathogenicity are being made upon an absolute paucity of evidence.

Is the literature upon the malarial parasites of man to pass into the same condition? It is a subject of great importance to medical practitioners in the tropics, and it would appear as if this was the case.

Under these circumstances must not every claim to the discovery of new species of protozoal parasites of man be subjected to the most searching scrutiny, and be fully verified before it can be generally accepted? And this brings me to the "bath of hæmatoxylin." What the writer intended to suggest was that, in making a claim to have discovered a new protozoal parasite of man results should be controlled by the use of the very best cytological methods—of which wet fixation by Schaudinn's fixative and staining by Haidenheim's iron-hæmatoxylin method is universally accepted as one of the most reliable. Here again the writer speaks, not with authority, but from experience. Some years ago thanks to the courtesy of a colleague he was permitted to examine some Giemsa-stained films from a species of *Hæmoproteus*. The fixation and staining were admirable and the appearances suggested a process of schizogony in the peripheral blood—a finding which would have confirmed that of Anschütz for *H. orizivora*. But a set of Schaudinn-fixed, Haidenheim-stained films from the same birds shewed entirely different appearances and suggested rather degenerative changes in the parasites. The writer is at present working upon *Blasiocystis hominis* along the lines suggested by Lynch in 1922, whose papers upon this parasite he has read with much appreciation, they suggest the existence of three species of *Blasiocystis* in man, but they do not dogmatize upon the position. The writer finds it necessary to examine fresh material, films stained by Giemsa's stain after methyl alcohol fixation, and preparations fixed by Schaudinn's fixative and stained by Haidenheim's iron-hæmatoxylin process. The last appear to provide the clue to the very puzzling forms met with in the former *P. ovale* was introduced into the literature upon the strength of blood films, presumably dried in air, and stained for one hour by Leishman's stain. Is not such staining unduly prolonged and under such circumstances may there not be aberrant distortion of the parasite forms, and even aberrant stippling of the red corpuscles?

What is the moral of this controversy? That there may—or may not—be more than three malarial parasites of man that in every case of quotidian malarial fever, and in every case of malarial infection where it is doubtful to what species the parasites found belong a most careful study should be made of the parasites encountered by the very best cytological methods. Such a study with regard to *P. tenuis* is at present being carried out by Major Sinton, and the writer looks hopefully to the results of his work to settle the dispute. If even a dog may have his day, Sir, may not a reviewer be permitted to offer criticism without calling down upon his head the thunderbolts of Zeus? For all the writer knows *P. tenuis* and *P. ovale* may not be the misinterpretations which he believes them to be so far from being killed, they may be in vigorous

and baneful activity all around us. But let us have further work and further evidence upon the subject. If the writer has erred in venturing to cast doubts upon this matter, he is content to have erred in good company. In routine blood examination of patients at the Calcutta School of Tropical Medicine during the past two years the writer has once—and once only, in 1921—come across forms which appear to resemble



Tenue Phases of a Malarial Parasite

those of *P. tenue*. He cannot, of course, say whether they are *P. tenue* or not. The film was one taken from an out-patient who refused to come into hospital, it was at first labelled "malignant tertian," but on further study the forms were seen to be peculiarly amoeboid. A sketch, taken at the time, is appended. Personally the writer would label such forms as forms of *P. falciparum* shewing unusually amoeboid activity. The film appears to shew both typical *P. falciparum* rings and *tenue* forms.

Yours, etc,

R KNOWLES,

MAJOR, I M S

Assistant Editor, Indian Medical Gazette

CALCUTTA

3rd August, 1923

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Service Notes.

THE USE OF THE TITLE "DOCTOR"

THE FOLLOWING ORDER ISSUED BY THE GOVERNMENT OF THE UNITED PROVINCES WILL BE READ WITH CONSIDERABLE INTEREST

(Copy of Government Order No 2955/P-N-328, dated the 2nd July 1923, Medical Department, to the Inspector-General of Civil Hospitals, United Provinces)

"With reference to the correspondence ending with your letter No 3143, dated the 30th of March 1923, regarding the demand on the part of the Provincial Medical Service Association that the courtesy title of 'Doctor' should be applied in official correspondence to qualified medical practitioners, I am directed to inform you that after careful consideration the Governor, acting with his Ministers, agrees to the adoption of the courtesy title of 'Doctor' as suggested. I am to add that such use, though conflicting with the practice obtaining in the United Kingdom, is in conformity with the usage adopted by Indian medical practitioners."

The question of the use of the courtesy title "Doctor" has aroused much discussion in England, but in that country the discussion was confined to medical circles. It would be interesting to see what would happen if the British Parliament were to interfere in a question which the medical profession in England regard as their own particular business.

Perhaps we are really coming to the parting of the ways and the medical profession in India is making up its mind to cut itself adrift from the antiquated conventions which are so dear to the old-fashioned doctor of the United Kingdom. In some ways this will be a pity, as the medical profession in India owes much of the prestige which it enjoys to its having been admitted to the brotherhood of medical men of the Empire. The question which medical men in India will have to decide for themselves is whether the benefits which are derived from this brotherhood compensate for the restrictions which are entailed by membership of the ancient medical corporations. It is very doubtful whether an independent governing body for medical education and registration in India would enjoy the respect of the lay community. Strictly speaking the title "Doctor" can only be claimed by an M D of a university and in practice the specialising surgeon always emphasises the fact that his title is "Mr", he feels that a slight is placed on him if he is called doctor. The lay public, however, refuses to observe the finer distinctions which are adopted in medical circles and uses the term "Doctor" indiscriminately. In India even among professional men themselves the term doctor means nothing more than qualified medical practitioner. In such matters custom is everything but for a Government to issue an order on such a subject is distinctly unusual and the result may be to draw the attention of the "fathers" of the profession at home to the tendency to revolt from their conventions and authority which is observable in many quarters at the present time. Revolution may be justified, but there is no advantage in effecting a revolution which results in a lowering of the status of the profession. It would be interesting to know what the views of the various Medical Associations are towards this very interesting order.

APPOINTMENTS AND TRANSFERS

MAJORS A H PROCTOR, DSO MB, I M S and W L HARNETT, MB, F R C S, I M S, appointed to be Civil Surgeons with effect from the 28th June 1922 and the 1st October 1922, respectively.

THE Governor in Council is pleased to appoint Mr K R Risbud, Acting Huzur Deputy Collector Satara, in addition to his own duties, to do duty as Superintendent of Mahabaleshwar, so far as the Civil

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administrative duties of the office are concerned, *vice* Lieutenant-Colonel G E Stewart, I.M.S. proceeded on leave, pending further orders

THE Viceroy and Governor General has been pleased to make the following appointment on His Excellency's Personal Staff, with effect from the 16th February 1923 To be Honorary Surgeon—Lieutenant-Colonel T B Kelly, D.S.O., F.R.C.S.E., Indian Medical Service, *vice* Lieutenant-Colonel B R Chatterton M.D. F.R.C.S.I., Indian Medical Service retired

HIS EXCELLENCY THE GOVERNOR IN COUNCIL is pleased to nominate Lt-Col J G G Swan C.I.E., I.M.S., Civil Surgeon Lahore, to be a member of the Governing Body of the Punjab State Medical Faculty, *vice* Lt-Col D M Davidson, C.I.E., M.D., I.M.S., resigned with effect from 3rd April 1923

HIS EXCELLENCY THE GOVERNOR IN COUNCIL is pleased to nominate Lt-Col H Broome, F.R.C.S. I.M.S. Principal and Professor of Surgery, King Edward Medical College Lahore, to be a member of the Governing Body of the Punjab State Medical Faculty, *vice* Lt-Col H Ainsworth, F.R.C.S., I.M.S., resigned with effect from the afternoon of 27th April 1923

CAPTAIN B Z SHAH, I.M.S., on general duty at the Sassoon Hospitals Poona, from 23rd April 1923 to 31st May 1923, both days inclusive, and thereafter to act as Civil Surgeon, Karwar, with attached duties

THE services of Captain R. C Watts, M.D. I.M.S., are placed temporarily at the disposal of the Government of Bihar and Orissa with effect from the 19th July 1923

LIEUTENANT-COLONEL W R BATTYE, D.S.O., I.M.S., is appointed Administrative Medical Officer in Central India and Residency Surgeon Indore with effect from the 1st April 1923

MAJOR V N WHITMORE, O.B.E. F.R.C.S.E., I.M.S., is appointed Civil Surgeon Ambala, with effect from the 19th May 1923 (afternoon), on transfer to the Punjab relieving Major W C M Charters I.M.D. transferred

MAJOR W C M CHARTERS I.M.D. is appointed Civil Surgeon Campbellpur, with effect from the 30th May 1923 (afternoon) relieving Major M L Puri, I.M.S.

MAJOR M L PURI I.M.S. is appointed Civil Surgeon, Rawalpindi, with effect from the 30th May 1923 (afternoon) relieving Assistant Surgeon Ram Lal of the additional charge.

MAJOR H M WILSON, O.B.E. I.M.S. made over charge of the duties of Superintendent of the District Jail at Lyallpur to Mian Abdul Aziz, Civil Surgeon on the forenoon of the 13th June 1923

LEAVE

MAJOR S J BHATHENA I.M.S., Civil Surgeon, Thana is provisionally granted leave for eight months with effect from the date of relief

CAPTAIN J B HANCE I.M.S., an officiating Agency Surgeon was granted privilege leave for ninety days, and furlough for nine months and three days, with effect from the 16th August 1921

LIEUTENANT-COLONEL P ST C MORE, O.B.E., I.M.S., Civil Surgeon Rawalpindi has been granted 6 months' leave, with effect from 30th April 1923 (afternoon)

MAJOR R A CHAMBERS, O.B.E., I.M.S., Principal, Medical School, Amritsar, has been granted one month's leave on half average pay, in continuation of the leave granted to him in Punjab Government notification No 25956 Medl, dated 24th October 1922

PROMOTIONS

THE following promotions are made, subject to His Majesty's approval Colonel to be Major-General—Walter Holland Ogilvie, C.B., C.M.G., K.H.P., M.B., *vice* Major-General Sir Courtenay Clark Manifold, K.C.B., C.M.G., M.B., transferred to unemployed pay pending retirement, with effect from the 24th June 1923 Major-General Ogilvie's tenure of appointment will reckon from that date

Majors to be Lieutenant-Colonels—Ernest Charles Hodgson, D.S.O. William Gillitt C.I.E., M.D., Charles Harrison Barber D.S.O., D.V. (Oxon) William Tarr, M.D. F.R.C.S.E. Hugh Watts, M.B., Ivor Davenport Jones M.D. Walter Taylor Emlyson, D.S.O. William Thomas McCowen, Hugh Ellis Stanger-Leathes John Morgan Holmes, M.B., Maurice Forbes White O.B.E. M.B.—dated the 30th July 1923

Captains to be Majors—Edward Slade Goss, M.C., Charles James Stocker M.C., M.D. Archibald Wallace Duncan Leon Francis Brandenburg, M.B. Edward Austen Penny, M.B. R. H. Candy, M.B., J C Bharucha H Hingston M.D., F J Anderson M.C., M.B., F.R.C.S., and R V Morrison, M.D.—dated the 29th July 1923

RESIGNATIONS

CAPTAIN JAI DEVA WARMA is permitted, subject to His Majesty's approval to resign his temporary commission with effect from the 24th May 1923, and to retain the rank of Captain

CAPTAIN GNANADICKAM IRA BENJAMIN is permitted, subject to His Majesty's approval, to resign his temporary commission, with effect from the 2nd June 1923 and to retain his rank

CAPTAIN GOVINDAN SANKARAN TAMPI is permitted, subject to His Majesty's approval to resign his temporary commission, with effect from the 15th June 1923

RETENTION OF RANK

WITH reference to Army Department Notification No 1987, dated the 14th October 1921, the undermentioned officers are permitted to retain the rank of Captain Shankert Keshav Phadke, and Joseph Robert Gwynne

WITH reference to Army Department Notifications No 608, dated the 4th May 1923, and No 761, dated the 8th June 1923 the undermentioned officers are permitted to retain the rank of Captain Khuda Bakhsh Awan, and Kiyattle Kannan Nambiyar

NOTICES.

LONDON SCHOOL OF TROPICAL MEDICINE
EXAMINATION RESULT—72nd Session, April to July, 1923

With distinction—Dr E Peterson—U S Navy (winner of "Duncan" Medal)

Dr A H Baldwin—Dept of Health, Commonwealth of Australia, Dr F McCallum—Dept. of Health, Commonwealth of Australia Dr E Pampana and Dr A Salama

Dr R. S Aiyar

Capt. M M Khan—Indian Medical Service

Dr W J E Phillips—Malaya Medical Service.

Dr J L Rebello
 Dr A N Kingsbury—Malaya Medical Service.
 Capt. F R Thornton—Indian Medical Service.
 Capt J W F Albuquerque—Indian Medical Service
 Dr N S Sethi
 Dr A J Keevil
 Dr D J Valentine.
 Major A N Thomas—Indian Medical Service
 Dr L S Chatterji
 Dr K K. Shenai
 Dr W Simmons—West African Medical Service
 Dr H Sheinbloom
 Dr M B Goverdhan
 Dr S W Hardikar—Nizam Govt. Service
 Dr H Morrison—West African Medical Service
 Dr G Gollerkeri
 Major K S Thakur—Indian Medical Service
 Capt C McIver—Indian Medical Service.
 Dr E C Cousins—Church of Scotland Mission
 Dr G W S de Saram
 Dr J G Dunles—Malaya Govt Service
 Dr B W Dakers—Kenya Medical Service
 Dr J R Chaudhri
 Dr A M MacRae—West African Medical Service
 Dr P Couacaud—Mauritius Medical Service
 Dr K T Thadan
 Dr J B S Baxter
 Dr L Ray—Public Health Service, U P, India.
 Dr M K. Gopala-Pillai—Travancore Govt Service
 Dr K. Singh
 Dr F. Sutcliffe—West African Medical Service

INTERNATIONAL CONGRESS OF OPHTHALMOLOGY (1925) NOTICE OF POSTPONE-MENT

THE Committee of British Ophthalmologists appointed to organize an International Congress in 1925 finds, with regret, that it is unable to do so in accordance with the conditions under which the British invitation was accepted by the Washington Ophthalmological Congress in 1922. It will be remembered that at Washington it was decided that the next Congress should be strictly international and that German should be one of the official languages. The Committee has since been informed that the Société Française d'Ophthalmologie, the Société d'Ophthalmologie de Paris and the Société Belge d'Ophthalmologie have passed resolutions to the effect that they feel themselves unable to participate in a Congress if Germans are invited. The Committee is of opinion that to proceed with the Congress in these circumstances would tend to perpetuate a schism in the ranks of ophthalmology and militate permanently against the progress of the science which all desire to promote. The Committee has, therefore, reluctantly decided to postpone the Congress.

MESSRS WATSON'S "SUNIC" HIGH FREQUENCY APPARATUS

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"WHO'S WHO IN X-RAYS"

WE have received from X-Rays, Limited, 11, Torrington Place, Gower Street, London, W C 1, a copy of this lavishly illustrated and interesting brochure. A list of some 600 hospitals and institutions equipped both at home and throughout the Empire and special war hospitals is followed by an album of photographs which shew different types of X-ray outfits as installed in hospitals, dental clinics, mobile laboratories, together with a set of photographs of the different departments of the firm at work.

X-Rays Ltd are a firm with a large organisation and one which has absorbed and includes several older firms of well known standing, as it incorporates the High Tension Co., and the former X-ray and electro-mechanical business of Messrs Siemens, Bros and Co. "Who's Who in X-Rays" will interest all workers in the subject, who may gain from the different types of sets and their mode of setting up as illustrated many useful points of information.

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Notice.

SCIENTIFIC Articles and Notes of interest to the profession in India are solicited. Contributors of Original Articles will receive 25 Reprints gratis, if asked for at the time of submitting their manuscripts.

Communications on Editorial Matters, Articles, Letters and Books for Review should be addressed to THE EDITOR, *The Indian Medical Gazette*, c/o Messrs Thacker, Spink & Co, P O Box 54, Calcutta.

Communications for the Publishers relating to Subscriptions, Advertisements, and Reprints should be addressed to THE PUBLISHERS, Messrs Thacker, Spink & Co, P O Box 54, Calcutta.

Annual Subscription to "*The Indian Medical Gazette*," Rs 16 including postage, in India Rs 18 including postage, abroad.

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Original Articles.

GLEANINGS FROM THE RECORDS OF THE GOVERNMENT MATERNITY HOSPITAL, MADRAS

By C A F HINGSTON, D.B.F.

LIFUT-COLONEL I.M.S.

*Professor of Midwifery, Madras Medical College, and
Superintendent Government Maternity Hospital, Madras*

and

Dr A LAKSHMANASAMY MUDALIAR B.A. M.D.
(Madras),

*Assistant Superintendent Government Maternity
Hospital Madras*

Extra-Uterine Pregnancy

DURING the last 10 years, 104 cases of extra-uterine gestation have been treated in this hospital, and we propose in this article to present an analysis of these cases and to give brief notes of some of the more interesting cases that were treated. The term extra-uterine pregnancy implies that the seat of pregnancy is at some point between the ovary and the uterus, whereas ectopic gestation includes the rare cases where pregnancy occurs in the rudimentary horn of a bicornate uterus. No case of pregnancy in a rudimentary horn has been recorded in this series. Tubal pregnancy was the most usual form of extra-uterine pregnancy met with, there being only 4 cases of ovarian pregnancy recorded in the series. In the tube the ovum may develop in one of three situations—in the ampulla, the isthmus, or the interstitial portion, the last is comparatively rare, only 3 cases having been recorded in the series. From the statistics it would appear that extra-uterine pregnancy is slightly more frequent on the left side than on the right side.

An analysis of the history of the previous labours in these women shows that it is relatively more common in multiparous women, or in those who have had but one or two children, and occurs more frequently in women who have had a fairly long period of sterility. Thus of the 104 women 29 were multipara, 25 with one child and 17 with 2 children. The period of sterility ranged from 2 years to 12 years, the average being about 3½ years.

Extra-uterine pregnancy would seem to occur at all ages within the period of fertility, the youngest of our cases was 16 years and the oldest 42, of the 104 cases, 76 cases gave no history of previous abortions, whilst 14 had one abortion, 8 aborted twice, 2 thrice, 1 aborted four times, and 1 five times.

There were 4 cases of ovarian pregnancy in the series. Of late years a number of cases of this variety of ectopic gestation have been recorded and it may here be noted that no case should

be diagnosed positively as one of ovarian pregnancy unless the following conditions laid down by Spiegelberg are satisfied—(1) the tube on the affected side should be intact, (2) the foetal sac should occupy the position of the ovary, (3) it should be connected with the uterus by the ovarian ligament, (4) definite ovarian tissue should be found in the wall. The last condition, however, is not insisted on, as in any case of tubal pregnancy which has progressed beyond the early stages, it may be possible to find ovarian tissue in some portions of the wall. We consider that a gestation may be considered as ovarian in origin when the sac is connected with the broad ligament and uterus like a tumour of the adnexa, and the Fallopian tube and ovarian fimbria can be shown to take no part in the formation of the sac.

Ovarian pregnancy, 8 months' gestation

K, aged 30 years, married 10 years before and had two children and one abortion 3 years before. The patient was admitted for severe pain in the epigastrium, duration 6 hours. The periods were said to have been regular the last one having come on four days prior to admission. There was no discharge per vaginam. On examination a fairly hard swelling was found, rising up to the umbilicus, with a slightly fluctuating feel about it. On vaginal examination, Douglas' pouch was found full and the outline of the uterus could not be distinctly made out. A provisional diagnosis of ovarian tumour was made and the patient prepared for operation. On opening the abdomen, this proved to be a case of ovarian pregnancy of the left side that had gone on to 8 months' gestation. The uterus and the left tube were flattened out over the front and left side of the tumour. The tumour had spread between the layers of the broad ligament and had pushed the rectum to the right side of the pelvis. The tumour was shelled out and supra-vaginal hysterectomy performed. The foetus was taken out before the tumour was dissected out, but the placenta was very adherent and so was removed with the sac.

Ovarian pregnancy left side, with a ruptured tubal pregnancy on the right side

Mrs A, 28 years an Indian Christian lady, had been married for 16 years but had had no children and no abortions. She was admitted into the hospital with a history of pain in the right iliac region which was first felt a month before. Since then she had more or less continuous pain with fever and occasional rigors. She had missed two periods, but there was no vaginal discharge. On vaginal examination the uterus was found not enlarged and a distinct swelling was felt on the right side and connected with the right tube. The diagnosis of extra-uterine pregnancy was made. On opening the abdomen a considerable quantity of clotted blood was found in the pelvis and among the intestines, on clearing which it was found that there was a ruptured tubal gestation on the right side and an unruptured ovarian pregnancy of the left side. Both tubes and left ovary were removed and as the woman was very weak, the uterus was left behind. The patient made an uneventful recovery and was discharged four weeks later.

When the ovum is embedded in the Fallopian tube, the course of pregnancy depends upon the seat of ectopic pregnancy. Thus in the case of ampullar pregnancy the possible terminations are (1) tubal abortion, (fig I), (2) tubal rupture, (fig II), (3) formation of a tubal mole, or (4) continuance of pregnancy to the later months or even to term. There were 18 cases of ampullar pregnancy. In this series in 8 cases tubal abortion occurred, in 7 tubal rupture took place

into the peritoneal cavity, in 1, rupture occurred into the layers of the broad ligament, whilst in 2 the ovum was just protruding at the fimbriated extremity prior to abortion. The abortion or rupture generally occurred before the 4th month, the earliest recorded being one of 5 weeks' duration. It may be stated that tubal abortion is the most frequent cause of a pelvic hæmatocele and that hæmorrhage in these cases generally tends to be limited and to collect in Douglas' pouch.

In cases of rupture into the peritoneal cavity there is a possibility of the ovum continuing to grow as a secondary abdominal pregnancy. Of these there are two cases recorded in this series.

The clinical features of a case of ectopic pregnancy vary and it is comparatively rare to meet with a case which presents all the classical symptoms. The cases noted herein may be broadly classified under four heads—

(1) Women who are struck down suddenly with severe pain in the abdomen and are profoundly collapsed—not at all common in this Presidency.

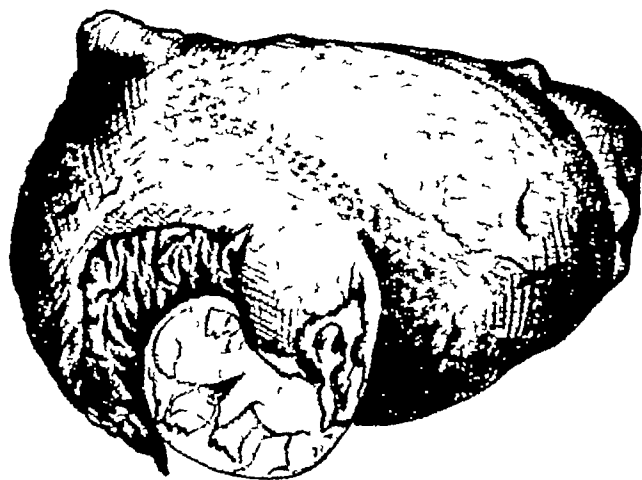


Fig I—Extra-uterine pregnancy at ampullar end showing tubal abortion

(2) Women who give a history of irregular periods with colicky pains and scanty hæmorrhagic discharge, possibly with a low temperature and an accelerated pulse,—a common type in this Presidency.

(3) Women with a chronic dull pain in the pelvis and seeking admission for constipation and painful micturition.

(4) No symptoms whatever, but having missed a period they come up for examination.

The first group of cases is not so frequent, there were but six in the whole series. The history of the attack, the condition of the patient with the general signs on examination clinch the diagnosis. The following is a typical case—

A young Hindu lady, aged 23, married two years previously, and who had had no children, was seized one night at 9 p.m. with severe abdominal pain and fainted. She was unfortunately treated with some remedies and next morning a lady doctor was called in who found the patient very pale with a rapid thready pulse and in a condition of collapse. In view of the grave condition

the patient was brought to the hospital at 9 a.m. On examination it was found that the patient had severe pain still in the lower part of the abdomen, dullness in the flanks, rigidity of the recti, extreme pallor, some amount of restlessness and air hunger and a typical hæmorrhagic pulse. She had missed one period and on vaginal examination there was fullness in the right fornix and blood on the examining finger. On opening the abdomen a large quantity of fluid blood welled out, on clearing which the nature of the accident was apparent—an early tubal pregnancy which had ruptured. The tube was excised and the seat of rupture was noted to be in the isthmal portion close to the uterine end.

It may here be stated that tubal rupture is the commonest mode of termination in isthmal pregnancy, and the nearer to the uterine end the seat of rupture is, the more severe the hæmorrhage, the shock and collapse. The mortality in these cases is very high indeed. Our mortality was 33.3 per cent.

The next group of cases are those with a history of irregular periods with colicky pains and scanty hæmorrhagic discharge, probably with a low temperature and an accelerated pulse. These cases are common and a careful vaginal

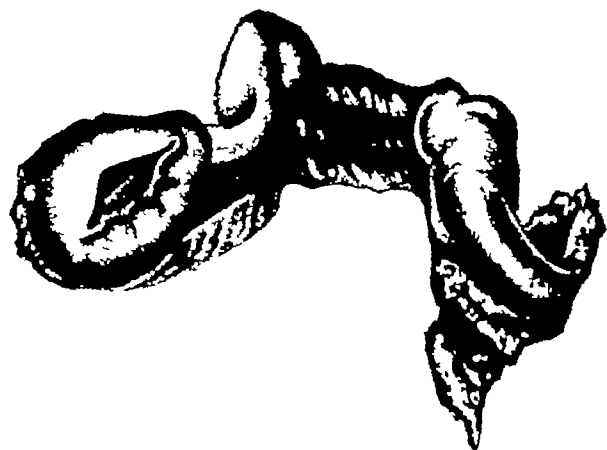


Fig II—Extra-uterine pregnancy showing seat of rupture at the isthmal end

examination generally reveals the presence of a soft swelling to one side of the uterus or in Douglas' pouch. The mortality in our cases of this group was 80 per cent. An accurate elucidation of the history in these cases is of the greatest value as the following case will show—

Mrs K, aged 32, married 16 years ago, had six children, the last 2 years previously. The history of the case was that nearly two months after the last period, the patient, whilst attempting to lift her child, felt a sudden catch in the right side and had to lie down for a couple of hours. The pain was gradually relieved with fomentations and home remedies but she noticed a slight hæmorrhagic discharge for the next three days. A week afterwards she again had an attack of a similar nature which repeated itself for the third time ten days before admission. For the last 10 days she had had chronic pain in the right iliac region, slight hæmorrhagic discharge per vaginam, occasional rigors and general malaise. On opening the abdomen a large extra-uterine pregnancy of the right tube was found. There was considerable hæmorrhage in the pelvis extending up as far as the umbilicus, but the tubal gestation had not completely ruptured. Matting of the omentum and intestines was found, the adhesions were separated and the tube was excised (Fig III).

It may here be stated that the presence of hæmorrhagic vaginal discharge with the pain and the history of amenorrhœa sometimes misleads the practitioner into mistaking the case for one of intra-uterine abortion with most disastrous results. We have had several such cases admitted where the practitioner had curetted the uterus and the tubal gestation had ruptured.

Mrs X was admitted into this hospital from an up-country station with a history of two months' amenorrhœa, pain, and bleeding per vaginam for which she was treated for a week without relief. Finding that the condition was not improving, the local doctor finally curetted the uterus but practically nothing was found on curetting. Her condition became very much worse, the pulse went up to 144 and there were signs of collapse. She was treated for the collapse and 48 hours later she was admitted into this hospital. On examination a large mass was felt almost up to the umbilicus in which the uterine outline could not be made out, the fornices and Douglas' pouch being completely occupied by this mass. An

rule and difficulty in diagnosis is inevitable from a mere local examination.

The following case is illustrative of the variety of cases mentioned in this group —

A D aged 23, married three years, had had no children and no abortions. Complained of pain, vomiting, constipation and difficulty in micturition. Duration 25 days. History of periods was regular but the last period still persisted (for 20 days). A vaginal examination was made and it was provisionally diagnosed as a case of uterine fibroid. On opening the abdomen, the diagnosis was found to be wrong and the tumour was found to be an extra-uterine gestation of four months' standing which had ruptured, and a large pelvic hæmatocele had formed, filling Douglas' pouch and the lateral fornices.

Conditions associated with Extra-uterine Pregnancy

Various diseased conditions of the adnexa may be found associated with the extra-uterine pregnancy.

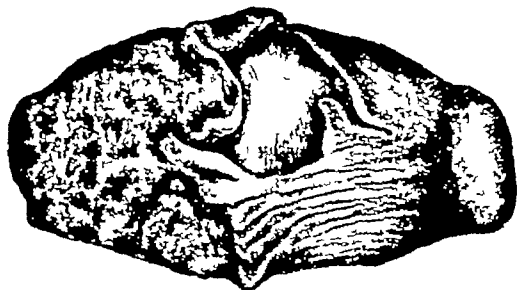


Fig III—Tubal pregnancy showing erosion of the tube and fetus in sac presenting, but not ruptured

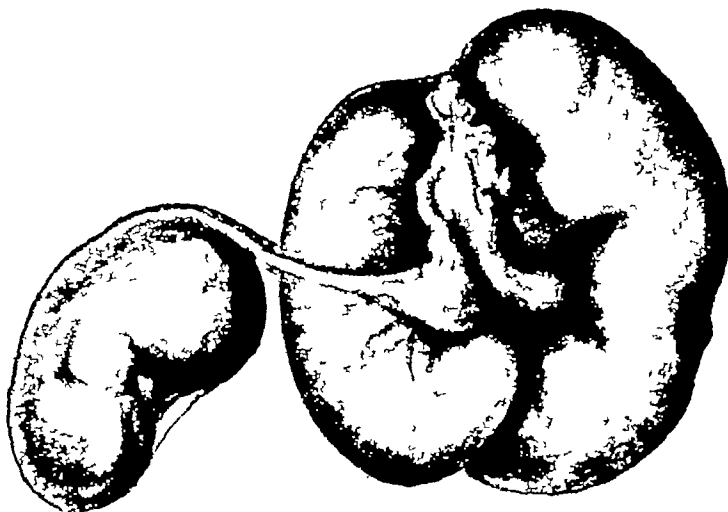


Fig IV—Extra-uterine gestation showing triplets

abdominal section was made and it was found that this was due to a large ruptured tubal gestation.

The expulsion of a uterine decidua is not by any means a symptom on which much reliance can be placed. In most cases, perhaps, not much care is bestowed on what is passed by the uterus and only rarely does one come across a case where a typical decidual cast is to be met with. Only a few typical decidual casts have been expelled whole in our cases. When the cast is passed and has been preserved it is doubtless of much diagnostic import.

The third group of cases possibly gives rise to greater mistakes in diagnosis than either of the other varieties. We find from the records that cases of this description have been mistaken for chronic salpingitis, pyosalpinx, uterine fibroids, ovarian growths and retroverted uterus with parametritis. Doubtless if a reliable history were available the diagnosis would present less difficulty to the general practitioner, but as in most of the cases that seek admission into the hospital, a clear history is the exception rather than the

The following table gives a list of such conditions which were found in this series —

Ovarian cyst	was found in 10 cases
Suppurating ovary	" " " 1 case
Hydrosalpinx	" " " 3 cases
Pyosalpinx	" " " 1 case.
Hæmatosalpinx	" " " 1 "
Fibroids	" " " 3 cases
Fibroids and Salpingitis	" " " 1 case.
Appendicitis	" " " 1 "
Rupture of Liver	" " " 1 "

Multiple Ectopic Pregnancy

Two varieties of this condition may exist there may be two or more foetuses in one tube or one in either tube. A twin pregnancy in a single tube is indeed a condition of considerable rarity. McCalla in 1909 collected 25 cases and since then other cases have also been recorded. Twin ova in the tube have been found not only in the early but also in the later months of a tubal pregnancy. So far as we are aware there is no case recorded of a twin secondary abdominal pregnancy. The

following cases therefore, will be of considerable interest.—

Dhana Bagiam, aged 38, married 22 years. Had 7 confinements (twins twice). No abortion. Last confinement 12 years ago. Was admitted into the Government Maternity Hospital with a history of 10 months' amenorrhœa and slight blood discharge for the last two months. On examination a large tumour rising to 3 inches above the umbilicus and cystic was palpable. The foetal heart sounds were not heard and no uterine contractions were felt. *Per vaginam*—cervix was small and flush with the roof of the vagina and rather hard, a dirty red discharge was present. On opening the abdomen, a sac adherent to the anterior abdominal wall presented on incising which dark brown fluid escaped and a macerated foetus was found inside. On removal of this and its placenta, another sac presented itself which contained another foetus and placenta which was removed. As much of the sac as possible was removed.

Cases of tubal pregnancy occurring simultaneously have been recorded several times but there is no authentic case to show that the pregnancies in either tube occurred at the same time and developed together. A case where there was an ovarian pregnancy on one side and a ruptured tubal gestation on the other has been recorded, but we regret that there is nothing to fix the exact period of pregnancy and to determine whether the pregnancies developed simultaneously in the ovary and the tube, or not.

Repeated Tubal Pregnancy

Cases of this description are not rare and Rabirowitz in 1911 collected 147 cases of this



Fig V—Tubal pregnancy, right side, hand and foot of foetus seen outside placenta in gestation sac. Foetus of about 18 weeks' growth

and the abdomen closed. The patient made an uneventful recovery and was discharged three weeks later.

Extra-uterine gestation, triplets

A Brahmin patient, aged 31 years, had had two children, the last child 12 years before. She was admitted into the hospital for pain in the lower part of the abdomen and back and painful periods for 12 years. The periods were regular and the last period was a month previously. On vaginal examination the uterus was found retroverted, and retroflexed and a distinct pulsating swelling was noted on the right side in the region of the right tube. On abdominal section this was found to be an unruptured tubal pregnancy of the right side. When the tube was opened triplets were found inside, two of them in one sac and the other in a separate sac (Fig IV). There is only one other case recorded, the one described by Krusen where the three foetuses were all found in the blood mass of a hæmatocele (about the second month of development), the burst sac occupying the ampulla of the tube.

condition. We had a most interesting case of a European lady who had had tubal gestation on the left side which ruptured and was removed. Two years later she was again operated on for an ectopic gestation in the right tube and, as it was an ampullar pregnancy, the outer third of the tube only was excised. Three years later the patient was admitted for severe pain and symptoms of collapse and an abdominal section was performed. The symptoms were found to be due to a tubal gestation in the remnant of the right tube which had been left behind. Pearson has recorded a case in which tubal pregnancy occurred twice in the same tube at an interval of four years, a normal full-term pregnancy intervening, and H. C. Coe has reported another interesting case where a four months' pregnancy was found in the

ampullary end and a lithopædion in the isthmal portion of the same tube. There has been no case recorded so far where ectopic gestation occurred thrice in the same woman as in the one herein reported, where it occurred twice in the right tube and once in the left.

The treatment of extra-uterine gestation carried out at this hospital is at once to remove the tube and clots in all cases where pregnancy has occurred in it. In those cases where there is any doubt about the diagnosis, the abdomen is opened.

We know that in some parts of the Presidency

as it is in Europe. We think that this can be explained by the fact that in cold climates there is a much greater congestion of blood in the pelvis and abdominal organs than in a hot climate, so that in this country, although we find in some cases the pelvis full of blood, the shock and collapse and hæmorrhage is less than in Europe and the chance of rupture is much less.

We have to thank Dr Rao and Dr Cama, M.B., B.S. (Bombay), House Surgeons of this hospital for valuable help rendered in collecting and tabulating these cases.



Fig IV—Ruptured extra uterine gestation, primary tubal—which, after rupture became inter-ligamentous. Secondary rupture. Fœtus is about nine weeks' growth and was found enclosed in the amniotic sac. Traces of isolated chorionic villi seen on left side of ovum. The upper part of the specimen is composed of portions of the left tube and left broad ligament with clotted blood.

it is still the practice for the practitioner to advocate expectant treatment, keeping the patient at rest until the mass is absorbed.

We have had to deal with many cases where expectant treatment has been carried out at first and the patient has had to come here subsequently for operative treatment. We think that nowadays expectant treatment is wrong as it is exposing the patient to unnecessary risks. We admit that there must always be some risk in sending a patient from up-country to Madras or to a centre where the operation can be carried out with some possible hope of success, but we think that the patient runs less risk in this than from the carrying out of expectant treatment. If the advantages of operation are clearly pointed out to the patient and her friends, they will not hesitate to have an operation done.

From what we know of extra-uterine gestation in England and India we are of opinion that in the majority of cases hæmorrhage is not so severe

THE PANDEMIC OF INFLUENZA IN INDIA IN THE YEAR 1918 *

(With Special Reference to the City of Bombay)

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Introduction—The preoccupations of a world war, the engrossing problems which have followed in its wake, and the epidemic prevalence of influenza on a considerable scale within British shores have so fully occupied our attention that the calamitous happenings in India during 1918 may well have been somewhat obscured. Our minds, inured as it were, to the gigantic events of the past ten years, may have failed to appreciate fully the magnitude of the scourge which in 1918 swept over the length and breadth of India and, within

* Note—Thesis approved of for the degree of M.D. (London University). Received for publication, 28th August, 1923—ED, I.M.G.

the space of two months, slew at the latest computation, no fewer than eight million of her people, which for virulence was without parallel even in India's chequered history, and which is probably unequalled in any other country in the world

It is the purpose of this thesis to examine in detail the features of this visitation, particularly as it appeared in Bombay City, where in his capacity as Assistant Health Officer the writer was intimately associated with, and to some extent responsible for the investigation and conduct of the epidemic within the city and island of Bombay, to discuss some of the difficulties and problems encountered in that investigation and to consider how far the lessons of the epidemic may help us in determining the best methods of dealing with any outbreak in the future

2 *Influenza in the past*—It may not be inappropriate to consider briefly what little information is available as to previous epidemics of influenza. According to Hirsch,¹ epidemics of influenza have periodically visited every quarter of the globe since the time of Hippocrates, and the disease may be followed into the remotest periods from which we have any epidemiological records. Apart from the outbreaks of catarrhal fever in ancient times, the nature of which must necessarily be a matter of surmise, an extensive pandemic of influenza seems to have occurred in the reign of Queen Elizabeth, and it is probable that India, China and Asiatic Russia shared in the visitation. Since then epidemics have occurred from time to time, notably in 1803, 1833 and 1837, involving Eastern as well as Western countries. In the year 1850, India was certainly visited by an epidemic of influenza, but there does not appear to be any evidence of serious mortality in connection with it.

The older generation will recall the last great pandemic of 1889-1890. In the spring of 1889 a catarrhal fever which had been prevalent in Asiatic Russia suddenly assumed pandemic proportions and, following the ordinary lines of communication, swept westwards, reaching Petrograd in October, Paris in November, and London in December. Thence the wave spread further westward across the Atlantic, and south-east, following the mail route, to India where it appeared in Bombay in February, spreading later all over India.

The origin of this epidemic is believed to have been in Bokhara, a semi-independent state of Russian Turkestan. When it is remembered that Bokhara is in trading communication with India, and within a few hundred miles of the Indian frontier, it is strange that the infection only reached India after an enormous *detour* of many thousands of miles over land and sea. The difficulties of direct communication between Bokhara and

India, particularly when the trade routes are rendered almost impassable by snow, probably account for this.

It is known, however, that in 1890, the remote Gilgit district of India was infected from Chitral, a still more remote outpost, and not from India,² and it is quite conceivable that a party of traders from Bokhara brought the infection to Chitral. The infection does not seem to have spread further into British India from this direction.

A contemporary view of the origin of the 1890 epidemic is given by Ellis³ "Appearing first in Bombay at the latter end of February or early in March, it seems to have been very closely connected with the movements of European troops, its almost simultaneous appearance at Delhi, Lucknow, and other large military stations in Northern India being probably attributable to the arrival of drafts from England, which at that season of the year are constantly pressing up-country to join the various regiments."

The writer has been at some pains to collect the scattered contemporary records of the beginnings of the epidemic of 1890 as it affected India in order to assist in elucidating, by analogy, the problem of the genesis of the 1918 epidemic, which, although apparently obvious, reveals on detailed examination some peculiar features which are discussed hereafter.

3 *The Genesis of the Epidemic*—The latter half of 1918 in India was in some respects a healthy period, apart from influenza it was abnormally free from epidemic disease, the incidence of plague was the mildest experienced for twenty years, and the failure of the monsoon had determined a malarial incidence below normal. The subnormal rainfall was, however, most unfortunate, for in the latter half of 1918 the stocks of food grains in India were relatively low, prices everywhere were abnormally high, and the scarcity of fodder was responsible for a great shortage of milk, which in many places was almost unprocurable.

War demands had greatly depleted the medical personnel of India, which at the best is inadequate when compared with the size of her population, and when the epidemic struck India she was ill-prepared to cope with a calamity of such magnitude.¹⁰

By whatever route it arrived, influenza became apparent in Bombay about the beginning of June 1918. It found there unlimited opportunity for development. In Dr Turner's graphic words, "Bombay during the month of June may be compared to a huge incubator, with suitable media already prepared for the insemination of germs of disease, the temperature, moisture and material in suitable condition, an overcrowded city with a large working class population living in

conditions which lend themselves to the rapid spread of disease, either insect-borne or from personal contact, should it be introduced."

It is axiomatic that an epidemic is either imported into a community from outside or that it arises from a previously existing endemic focus, assuming an epidemic character as a result of increased activity on the part of the virus or diminished resistance on the part of the population in which the focus persists. That the epidemic in Bombay was what may be termed endogenous is by no means an impossible proposition. This is supported by the work of Lord (quoted by Osler)⁴ who many years ago demonstrated *B. influenzae* in 30 out of 100 unselected cases of acute and chronic bronchitis during a non-epidemic period in Boston, Mass., by the known frequency in all communities of unsuspected carriers of microbic infections, and by the generally accepted fact that the source of every epidemic of microbic origin must be traceable to some previously existing case or carrier. There is the further possibility, largely discredited at the present time, that an epidemic of influenza may have its origin in an epizootic among the lower animals, particularly equines. It is sufficient to say that equine influenza or "pink eye" was unknown in Bombay at the time.

Of much greater significance than these general considerations is the fact that in February and March 1918, an epidemic of an infectious disease, in some respects closely resembling influenza, was reported from the Thana district, a rural division of Bombay Presidency.¹⁰ This outbreak did not attract any particular attention at the time but, taken in conjunction with the facts that fatal cases notified as "influenza" had occurred in the jails of the Presidency in 1917, and that the mortality rates during March and April 1918, throughout the Presidency and Sind were appreciably and unaccountably in excess of the normal for the time of year, its significance is much enhanced. In point of time, moreover, this outbreak coincided precisely with epidemics of influenza reported by Kabeshima and Lee in China and Japan, and by Opie at Camp Funston, U. S. A. On the other hand it was generally believed that the epidemic entered India by the sea route, and there are many considerations which tend to support this proposition. The known prevalence of the epidemic in the United Kingdom, Southern Europe and Egypt, antecedent to its appearance in Bombay City, its first appearance in Bombay as the principal port of entry for military and passenger traffic rather than in any other part of India, its conformity with natural sequence, both geographical and chronological, in attacking the other great seaports of the East, Karachi, Colombo, Rangoon, Singapore and Shanghai and, moreover, the general resemblance between the epidemic

of 1918 and its predecessor of 1889-1890 as regards the manner of its dissemination—all these facts indicate, with a cogency which it is difficult to resist, that the epidemic entered Bombay from outside and that it entered by the sea route. The problem, however, is not so easy of solution as it appears, for on enquiry it was found that although the earliest cases to be diagnosed, or rather suspected, in Bombay occurred on board a transport which arrived in Bombay on May 29th, these cases did not develop until the ship in question had been in dock and in free communication with the city for 48 hours—a period no longer than the incubation period of the disease, and no cases had occurred on board the transport prior to its arrival in Bombay. Precisely similar events occurred in Karachi on the arrival there of a transport on June 20th, within 48 hours of berthing cases occurred on board which heralded the general outbreak in the port. These are facts which it is much easier to gloss over than to explain, and in the present state of our knowledge it must be admitted that the genesis of the epidemic in India is still an open question, unless, indeed, we postulate the existence of some known epidemiological factor "X" which, introduced from without, turns a smouldering endemic focus into a blazing conflagration.

It is conceivable that the phenomena of symbiosis among pathogenic organisms may explain the nature of this "X" factor, if such exists. It is possible to imagine, for instance, that a particular strain of streptococcus or pneumococcus introduced into a community, more or less saturated with a relatively harmless strain of influenza, might assume highly virulent qualities in symbiotic combination. This is merely surmise, but it is known that *B. influenzae* grows most readily in symbiosis with other organisms and this observation was put to practical advantage in the preparation of vaccines at the Central Research Institute, Kasauli, which is the principal Government Research Laboratory of India.

4 *The first phase. Methods of investigation.*—It will be realized that the investigation of an epidemic of a non-notifiable disease of low mortality in a population, the great majority of which are unable or unwilling to obtain the services of a doctor trained in Western methods, presents many difficulties and affords ample scope for statistical fallacy, but the material in a population of well over one million is large enough to reduce statistical errors to reasonable dimensions. In the investigation of this outbreak it was clear that little help could be obtained from the usual sources, namely notifications and mortality returns, and it became necessary to resort to other methods. Scattered throughout the island of Bombay there are ten municipal dispensaries, each in charge of a qualified

medical man, where free medical relief is available for the poorer classes. The records of these dispensaries, which are resorted to by over 100,000 different individuals in the course of a year, proved to be a valuable source of information. The diagnosis at these dispensaries is necessarily of the rough-and-ready order, but their records afforded a fairly accurate index of the rise, climax and fall of morbidity due to the epidemic among the general mass of the population. They also give an accurate indication of the age and sex incidence of the disease among the dispensary-attending population. The district registrars in medical charge of these dispensaries also supplied information, according to a comprehensive scheme of enquiry, regarding the clinical features of the disease. These results, based on nearly 3,000 cases, were analysed and compared with clinical notes obtained from other sources, and the leading medical practitioners of the city were asked to furnish data regarding the types of cases met with in private practice. A third source of information was the large firms, schools, banks, mills and other large employers of labour.

As a result of this line of enquiry it was possible to elicit details of the incidence among a population-group numbering nearly 100,000 persons, embracing almost every caste and class in the city, as well as topographical and chronological data of some importance.

5 *Incidence during the first phase*—The topographical incidence of such an all-pervading epidemic as influenza is of little interest except in its earliest stages. The earliest cases among the civil population appear to have occurred in the Indian ranks of the City Police. On June 10th a group of seven police sepoy, one of whom was employed at the docks, was admitted to the Police Hospital with what appeared to be influenza. By the 19th, fourteen more cases were admitted, of whom four were from the Docks. A reference to Table II, * will show that after the Police the next group to be attacked, on the 15th of June, were the employees of Messrs W and A Graham's shipping firm. Next day the men of the Government Dockyard succumbed, followed on the 17th of June, by the first of a very large number of the employees of the Bombay Port Trust and the Hong Kong and Shanghai Bank. On the 18th the Government Telegraph Department was affected and on the 19th the Mint. It may be observed that the latter institution abuts on the harbour between the Government Dockyard and the Ballard Estate of the Port Trust. By the following day the disease had spread to the mill area in the centre of the island and thereafter rapidly became general. From a perusal of these data it is difficult to resist the

conclusion that the origin of this epidemic was in some way connected with docks and shipping.

The comparative incidence as between one group of employees and another depends, of course, on so many incalculable factors that it would be useless to speculate on its significance, but it may be pointed out that the highest recorded incidence was at Green's Restaurant where nearly 60 per cent of its staff, which consists almost entirely of Goanese cooks and waiters, were affected. The probable reasons for this very high incidence are the constant association by day and night of the staff with its clientele and the inadequate and overcrowded living accommodation provided for them on the premises. The lowest recorded incidence was among the health department sweepers—*halalkhores*—male and female. These are Hindus of the lowest caste, and are employed in the removal of night soil and refuse. They suffered to the extent of only 4 per cent. This is by no means easy to explain. There is no question of caste or occupational immunity, for the mortality from zymotic diseases is noticeably high among low caste Hindus. They are men and women of poor physique, perpetually on the verge of starvation, beset by usurers and addicted to wild gambling and the immoderate consumption of a crude form of alcohol known as "country spirit." The conditions under which they live are the despair of the sanitarian, and yet they remained almost untouched by the epidemic. It is true that their work lies mainly out of doors but the incidence among other outdoor workers, for example the postmen, the policemen and the telegraph messengers, was nearly up to the average. This apparent immunity of low-caste Hindus during the first wave failed to manifest itself during the second wave, and, as will be seen later, one of the striking features of the second wave was the excessive mortality among those very classes which escaped so lightly during the first.

The incidence among school children was nearly 50 per cent, almost double the mean incidence among the adult population. One school where the pupils were all boarders, escaped entirely.

A heavy incidence among children and young adults seems to be indicated in Table IV, in which it is seen that the first three decades of life furnished over 70 per cent of the cases treated at municipal dispensaries. Sex-incidence is more difficult to estimate, but returns from schools (Table III) and from municipal dispensaries (Table IV) seem to show that the incidence was perceptibly less among females than males. With regard to nationality Table II shows that the incidence among Indians was 29 per cent as compared with 17 per cent for Europeans. This difference is

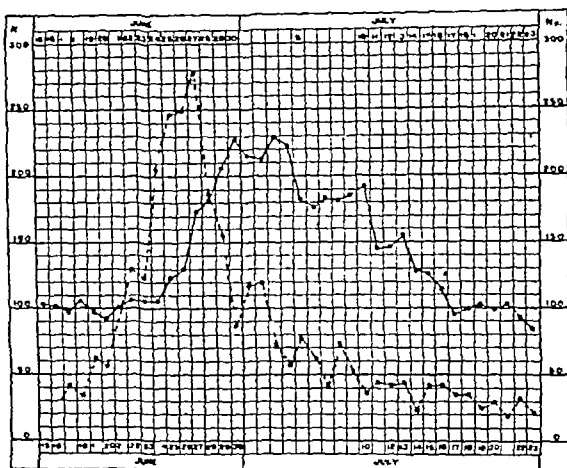
* The tables are given at the end of Major Phipson's articles—Ed, J.M.G.

probably attributable to the differing conditions of life, and the closer aggregation of Indians, both at work and at home

6 *Clinical features in the first phase*—The symptomatology of the disease as seen in Bombay corresponds in some respects with the classical type. It is not easy to fix the incubation period of a disease which spreads so rapidly as does influenza, owing to the difficulty of eliminating fallacy due to multiple ex-

CHART I

Showing cases of "Simple Fever" treated at municipal dispensaries (—) and daily general mortality (---) in Bombay City, June 16th—July 23rd, 1918



posures. It is probable, however, that the period is as a rule a matter of hours rather than of days. The onset is usually rather abrupt, marked by a chilliness not amounting to a rigor. The temperature rapidly rises to between 102 and 104°F, though an initial rise to 106° is not uncommon.

The fever is accompanied by severe headache, orbital or frontal, and distressing pains in the back and limbs unrelieved by change of posture. The fever persists with slight morning remissions for 2 or 3 days and then subsides, leaving the patient weak and depressed. Other features which occur with great frequency are anorexia and insomnia, both of which commonly persist for some days after the fever has subsided. Constipation is almost invariable, the tongue is generally furred but not characteristically.

The type of disease most commonly met with was not definitely catarrhal. A slight coryza and suffusion of the conjunctivæ were sometimes observed but almost invariably some degree of congestion and catarrh of the tonsils, pharynx and upper respiratory passages leading to an irritable cough. Occasionally this inflammatory process spread to

the bronchi and lungs and assumed a definitely broncho-pneumonic character. Enlargement of the cervical or other lymphatic glands was rare. The liver and spleen were not noticeably enlarged or tender, perspiration was commonly very profuse and exhausting. The pulse was as a rule, increased in frequency proportionately to the rise of temperature. No eruption was reported. The above were the features of a typical uncomplicated case and the great majority of the cases appeared to conform more or less closely to this type. The other classical varieties of the disease, in which the respiratory, the alimentary or the nervous systems were involved, were all represented. The abortive type, in which the symptoms are limited to malaise, slight aches and pains and a temperature less than 100°F is deserving of notice, as it seemed to be fairly frequent among Europeans and may to some extent account for the lower incidence among Europeans as indicated in Table II, in which attacks which did not disable sufficiently to lead to absence from work would not be taken into account.

In private practice capillary bronchitis, when it occurred, was a very fatal complication both in adults and in young children, other complications which were often fatal in weak and debilitated patients were hyperpyrexia, delirium and other cerebral complications and cardiac failure. Reports from schools show that children of school ages, though very susceptible—one of the largest schools reported over 70 per cent of its pupils affected (*vide* Table III)—did not appear to suffer severely when attacked.

Examination of the blood was carried out by the writer in a number of typical cases in the early days of the epidemic. The findings were briefly as follows. The leucocyte count per c mm. averaged 6,295 in 17 consecutive cases. Two of these showed obvious leucocytosis due no doubt, to some intercurrent septic condition. Excluding these two cases the mean of the remaining 15 observations was 5,614. Differential leucocyte counts gave the following results (mean of 22 observations) —

	Per cent
Polymorphonuclears	65
Eosinophiles	0.5
Large mononuclears	14
Lymphocytes	32.5

These figures show but slight variation from the normal and such as exists may be described as a slight leucopenia with a tendency to relative lymphocytosis. They are of little interest except in a negative sense.

7 *Mortality during the first phase*—The effects on mortality of an epidemic of

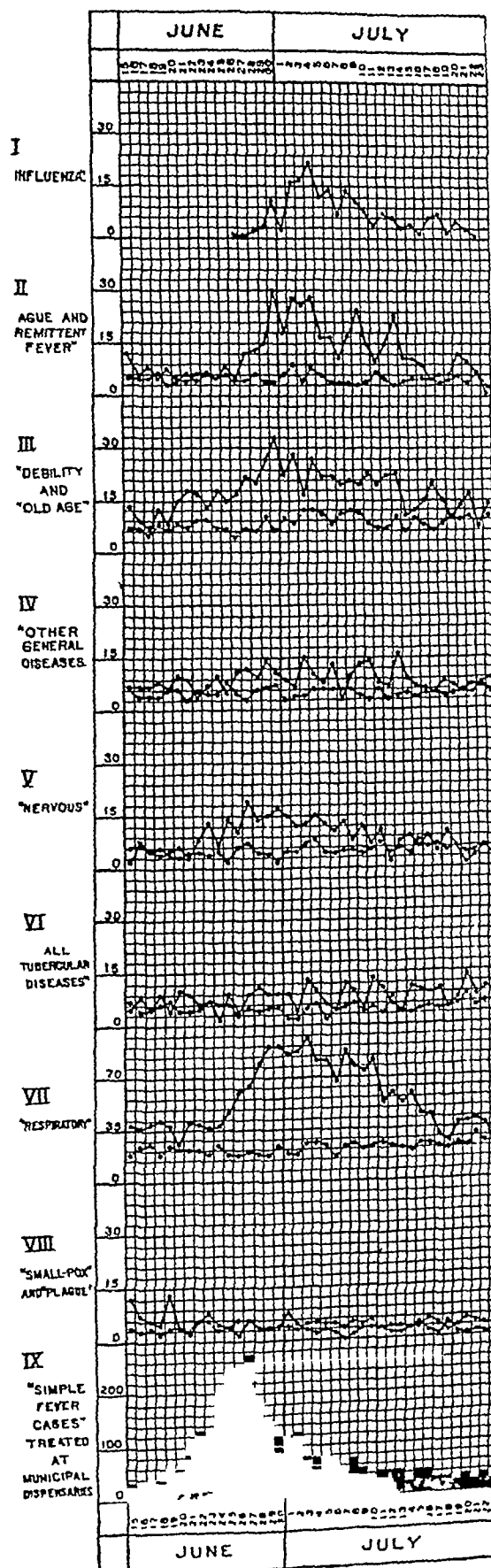
influenza are not to be sought in the mortality returns or influenza alone, for the disease "fights in part under its own flag and in part treacherously under other flags"⁵ If this is true in England where mortality returns are fairly accurate, it is doubly true of Bombay, where owing to the prevailing social and economic conditions, there is no alternative other than to classify all uncertified deaths,—which are very numerous,—on a diagnosis arrived at by enquiries instituted after death by municipal agency. A reference to Chart I will show the general effect of the epidemic in Bombay on the general mortality, the number of cases of "simple fever" treated at municipal dispensaries being taken as a measure of the prevalence of the epidemic. It will be seen that there was no marked rise until some days after the disease had become prevalent all over the city, and that its decline was slow and gradual as compared with the abrupt fall in morbidity. Taking the normal average daily mortality to be 100 at this time of year the deaths during the period June 15th to July 15th should have amounted to 3,100. The actual total during this period was 4,740. The difference between these two figures 1,640, gives a rough indication of the total mortality due to the epidemic.

Chart II shows the malignant effect of influenza on the mortality returns from several other diseases. The rise in mortality under the heading influenza itself begins late owing to the difficulties of diagnosis, and is comparatively insignificant, but there is a very marked rise in mortality from "ague and remittent fever," "debility" and "old age." Mortality from respiratory diseases soon more than doubles itself, and remains high for a long period. The effect on nervous diseases is less marked but quite perceptible, whereas the mortality from the only two other infectious diseases which were to any extent prevalent, i.e., plague and small-pox, remains almost unaffected and shows if anything a tendency to decline concurrently with the rise in general mortality. No particular significance can be attached to the decline of plague and small-pox, as it would probably have occurred in any case, but it is deserving of mention that in previous epidemics it has been observed that on the approach of an influenza epidemic other infectious diseases "seem as it were to retire from the fray to make room for its triumphant progress"⁶

The case mortality can hardly be determined with any approach to accuracy, as the number of cases and the number of deaths are both conjectural. If, however, we apply the known mean incidence (29 per cent) among the population group of 97,100 referred to in Table II to the total estimated population of Bombay, say 1,100,000—we obtain a figure of

CHART II.

Shewing the effect of the epidemic on mortality from various diseases in Bombay City, period June 16th—July 23rd, 1918



300 000 as the total number of influenza cases among the civil population of Bombay. Assuming the total mortality direct and indirect due to the epidemic to be 1,640 we arrive at a case mortality of about 5 per cent and a death-rate for the period of the epidemic of 1.5 per 1 000 living.

The first phase of the epidemic in Bombay thus lasted for barely four weeks. In this short period the epidemic cost Bombay over 1 600 lives at least a million working days and an incalculable amount of discomfort, expense and inconvenience. But serious as it was, the outbreak was insignificant as compared with what was to follow.

8 *The second phase*—For a period of nearly two months after the conclusion of the outbreak the health conditions of the city of Bombay remained normal. Other epidemic diseases were at a low ebb and it seemed as if the city had shaken itself free from the pestilence. About the 10th of September with very little warning a second wave descended on the city, having its origin as far as can be ascertained in the highlands of the Deccan about 100 miles inland.

The total daily mortality for the city was 102 on September 10th, about normal for the time of year. It had risen to 219 on the 16th, 314 on the 19th, 427 on the 23rd, 547 on the 27th, 682 on the 29th and 712 on the 30th. Thus the mortality had risen sevenfold in three weeks. The highest daily mortality was 768 on the 6th October. During the worst plague epidemic the city has ever known the highest total mortality on a single day was 433 (on February 15th 1900). It can be legitimately assumed that the whole of this enormous rise in mortality was due to influenza.

The mortality began to decline after the 6th of October and by the end of October the mortality was 135 and finally reached normal figures on the 11th November.

This statement can give but a bald idea of the havoc which was wrought in the city of Bombay by the virulent wave of September-October.

As the mortality rose during the middle of September and a pandemic seemed imminent it soon became apparent that the organization of the Municipal Health Department, meant for normal times and ordinary outbreaks of infectious disease, would not be able to cope with the situation and special measures on a very large scale would be necessary. These consisted in the first instance of a publicity campaign designed to bring home to the people simple facts regarding the control and treatment of the disease and of an appeal to public bodies and private institutions for assistance in personal service and in kind.

Circular letters were addressed to large employers of labour suggesting the steps to be taken. Posters in English, Marathi and Gujarati were put up and leaflets circulated advising the people to call in medical help or to go to hospital when taken ill, and offering free medical treatment, milk, and "pneumonia jackets" in their own homes to those who were reluctant to go to hospital. The pneumonia jackets were made on contract in large numbers. They consisted of jackets made of two pieces of cloth with about an inch thick layer of unbleached cotton between, and sewn like a quilt to keep the cotton in position. They were not buttoned in the middle but fastened with tags sewn at the side. They were found to be a good substitute for woollen clothing which the poor could not afford, and were very greatly in demand. A special medical officer was placed on duty to assist voluntary agencies in organizing relief measures and to co-ordinate the efforts of individuals to the best advantage. Temporary or table dispensaries were put up by the Municipality as well as by voluntary organizations in conspicuous places in the city, and in a short time there were about 100 such dispensaries where supplies of medicine and milk could be obtained.

Arrangements were entered into with several milk vendors and owners of milch cattle stables to give pure milk in specified quantities against demand coupons signed by certain municipal officials, the entire cost being met from municipal funds. Additional medical men were entertained to visit the poor and treat them in their homes, if unwilling or too ill to be moved to hospital. Several temporary hospitals were opened and many of the principal Indian communities opened special hospitals for the reception of their co-religionists. An immense amount of valuable work was done by volunteer agencies among which the various Indian Student Societies were very prominent. The very large number of corpses of Hindus, amounting to 12,000 within a few weeks, to be disposed of by burning according to Hindu rites, led to great scarcity of the wood fuel employed for the purpose, and the cost of these ceremonies was partly met from public funds and partly by the Hindu community as a whole, so that the poorer Hindus were put to no expense in the disposal of their dead. Large gifts of cotton cloth and blankets were received from the various mills and firms in the city. The appeal for public co-operation met with such a wonderful response, and so whole-hearted was the devotion of all workers in carrying out the various relief measures adopted, that it is probably safe to say that there was hardly a house in the city or a unit of the population that did not have a chance of relief, hundreds of lives must have been saved by the efforts of these organizations and the

provision of hospitals and dispensaries, and in thousands of homes much must have been done to mitigate the horrors of the epidemic among the poorer and more ignorant classes in the city.¹¹

9 *The clinical aspect of the second phase*—

This resembled in many respects that of the first phase with the important difference that fatal complications were far more frequent. Broncho-pneumonia was responsible for the great majority of deaths, and among Indians tended to assume a markedly toxæmic type, it seemed to be as fatal to strong adults as to young children and to the old and debilitated. Colonel Gordon Tucker, R.M.S., Professor of Pathology at the Grant Medical College, Bombay, describes the post-mortem findings in the following words: "the condition which causes death is a capillary bronchitis with only occasional patches of pneumonic consolidation. Hæmorrhagic extravasations under the mucous membranes are frequent, mostly in the mucous membrane of the stomach, the trachea, and into cellular tissues, especially of the posterior mediastinum. In one brain removed there was a large sub-arachnoid hæmorrhage almost covering the whole of the right cerebral hemisphere. The blood within the heart shows marked tendency to clot within both ventricles, stringy clots extending into the pulmonary artery and aorta being frequent. There is a marked distension of the right ventricle, and this may be obvious during the last few hours of life in the form of epigastric pulsation. Acute catarrh of the trachea, larger bronchi, of the stomach and of the last few feet of the small intestine is almost constant. The lungs are intensely congested and œdematous, much muco-pus can be squeezed from the smaller tubes and the greater portion of the lungs is airless. Actual consolidation is generally shown only by small pea-sized masses. The pseudo-lobar form of broncho-pneumonia is rare. Microscopically there is intense infiltration of the walls of the lung alveoli with small round cells, these walls being markedly thickened. Here and there are found minute extravasations of blood into the alveolar walls. There is hardly any extravasation or inflammatory exudation into the alveolar spaces, which are almost airless. Death takes place from acute failure of the right ventricle or more commonly from the accumulation of the watery exudation in the smallest bronchioles causing asphyxia."

10 *The bacteriological aspect of the epidemic*—In the early days of the epidemic it was found that a bacillus indistinguishable from the *B. influenza* of Pfeiffer could be demonstrated in the naso-pharyngeal mucus of a considerable number of patients, though by no means in all, who were suffering from the disease. In some cases the predominant organisms

appeared to be pneumococci, streptococci, or *M. catarrhalis*, in other cases one or other of these organisms was found in association with the influenza bacillus. During the virulent phase of the epidemic Glen Liston¹⁰ found that the pneumococcus and the influenza bacillus were the only pathogenic organisms at all constantly met with in fatal cases and were almost invariably in association. Greig and Maitra¹⁰ working in Karachi, made similar observations and these two workers frequently found these two organisms in pure culture in the accessory sinuses of the nose and ear. The almost constant appearance of the pneumococcus as an associated infection in fatal cases among Indians is of interest as throwing some light on the cause of the very high relative mortality from the epidemic in India. Higher it is believed at present than that of any other country in the world. The susceptibility of the Indian to pneumococcus toxæmia is a fact well-known to medical officers practising in India and the Indian himself has a well-founded horror of the very name of pneumonia which is associated in his mind with a very fatal disease. Its clinical manifestations differ from those of pneumonia seen in England, the toxæmic element being much more in evidence and massive lung changes much less obvious clinically.

It may be observed that army records show that the normal incidence of pneumonia among Indian troops is nearly four times that among British troops whilst during the period of the epidemic the death rates for British troops were 8.96 per 1,000 for influenza and 0.65 for pneumonia as compared with 15.21 and 6.18 respectively for Indian troops.¹⁰

Thus during the epidemic, for every British soldier that died of pneumonia nearly ten Indian soldiers died from the same disease and from what was presumably a similar infection. In Madras unlike other parts of India the pneumococcus was not often found in association with fatal cases and this Presidency as a whole suffered comparatively lightly during the epidemic. Streptococci so commonly found in England as an associated infecting organism, were as rarely found in Madras as elsewhere in India.

11 *Some statistics of the second phase*—A statistical study of the second phase affords some data which in some respects are more reliable than those for the first phase. The incidence rate during the first phase was probably as nearly accurate as it is possible to obtain in an enquiry among a large civil population. The mortality figures on the other hand are less reliable, as they could only be arrived at in bulk by the difference between the estimated normal and the actual mortality, which showed an increase of about 50 per cent only. During the second phase the stress of

work attending the organization of relief measures did not permit of the prosecution of any detailed enquiry into incidence, but the mortality figures were more reliable since a very much larger proportion of the total mortality on which the figures are based, was due to influenza, the ordinary causes of mortality being relatively negligible during the second phase. This point is well illustrated in Chart III.

The total number of deaths that occurred in Bombay City during the 62 days of the second phase (September 10th to November 10th) was 20,258. Subtracting from this the figure representing the normal mortality for the period, one obtains the figure 14,678 which represents the death-roll due to the second phase. This is equivalent to 13.3 per 1,000 of the estimated population or considerably more than three times the mortality occurring in the urban populations of England and Wales during all three epidemic waves of 1918-1919. These figures are given by the British Ministry of Health as follows —

(Estimated total population of the 96 chief towns of England and Wales, 16,577,344)

No of influenza deaths per 1,000	
(period June 22nd—Aug 10th, 1918)	0.29 per 1,000
Do do period Oct 12th—Dec 28th,	
1918	2.69 per 1,000
Do do period Feb 1st—April 5th	1.04 per 1,000
Total for the 3 periods	4.02 per 1,000

High as was the mortality in Bombay City, it was very much less than the mortality in India as a whole or in certain provinces of India which suffered four times as severely as did Bombay City. These differences are shown in the following table¹⁰ —

Province	Influenza death rate per 1,000
Central Provinces and Berar	56.8
Delhi	55.6
Bombay	45.9
Punjab	42.2
N-W Frontier	40.6
United Provinces	22.9
Coorg	19.0
(Bombay City)	13.3
Madras	12.7

Province	Influenza death rate per 1,000
Assam	11.4
Bihar and Orissa	10.3
Burma	6.0
Bengal	4.7
Total for British India	20.6

The Registrar-General in his annual report for 1918-1919 estimates the mortality due to the epidemic throughout England and Wales at 4.7 per 1,000 of population or less than one-quarter of the mortality for all India.

The case mortality in Bombay City could only be determined among hospital patients and the combined rate for all the hospitals in the city was 34.21 per cent, but, as only the worst cases and the poorest class of people were received in the hospitals, this figure can hardly be taken as an index of the case mortality in the general population. Of the total number of 20,258 deaths, 10,506 were among males and 9,752 among females, so that the proportion of women to men who died during this period was 92.82 per cent against the usual average of 77.24. For every hundred men there are 53 women in the city. Thus a substantially higher mortality among women is indicated and this is in agreement with the figures for the whole of India.

It was found that 36.2 per cent of the deaths occurred among persons 20 to 40 years old. The figures for other provinces of India also illustrate the higher mortality in the 3rd and 4th decades of life and are in general agreement with those for England, France and America. The mortality of individual communities is deserving of some notice. The mortality figures per 1,000 of community-populations were —

1 Europeans	8.3
2 Parsees	9.0
3 Eurasians	11.9
4 Jews	14.8
5 Indian Christians	18.4
6 Caste Hindus	18.9
7 Mohammedans	19.2
8 Low Caste Hindus	61.6

These figures are not devoid of interest. The order given above reproduces with remarkable

CHART III

Shewing daily mortality in Bombay City, September 1st—November 16th 1917 ——— 1918

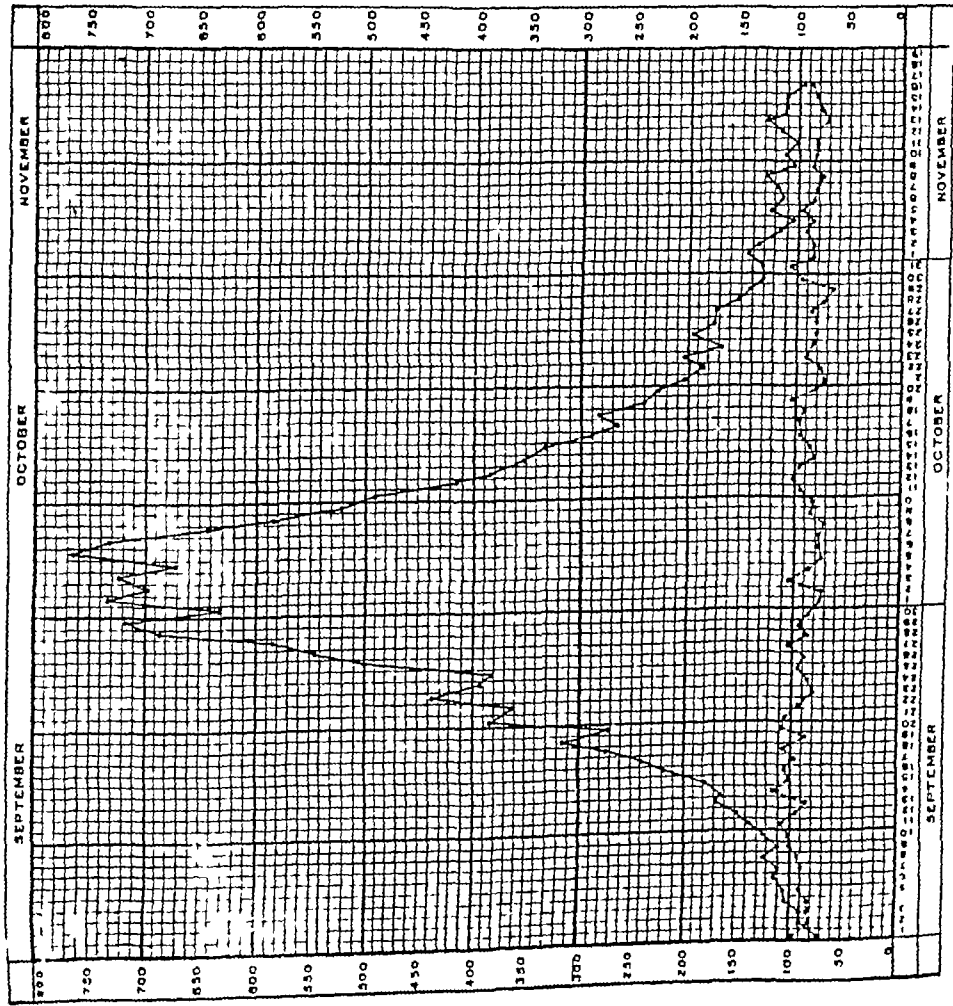
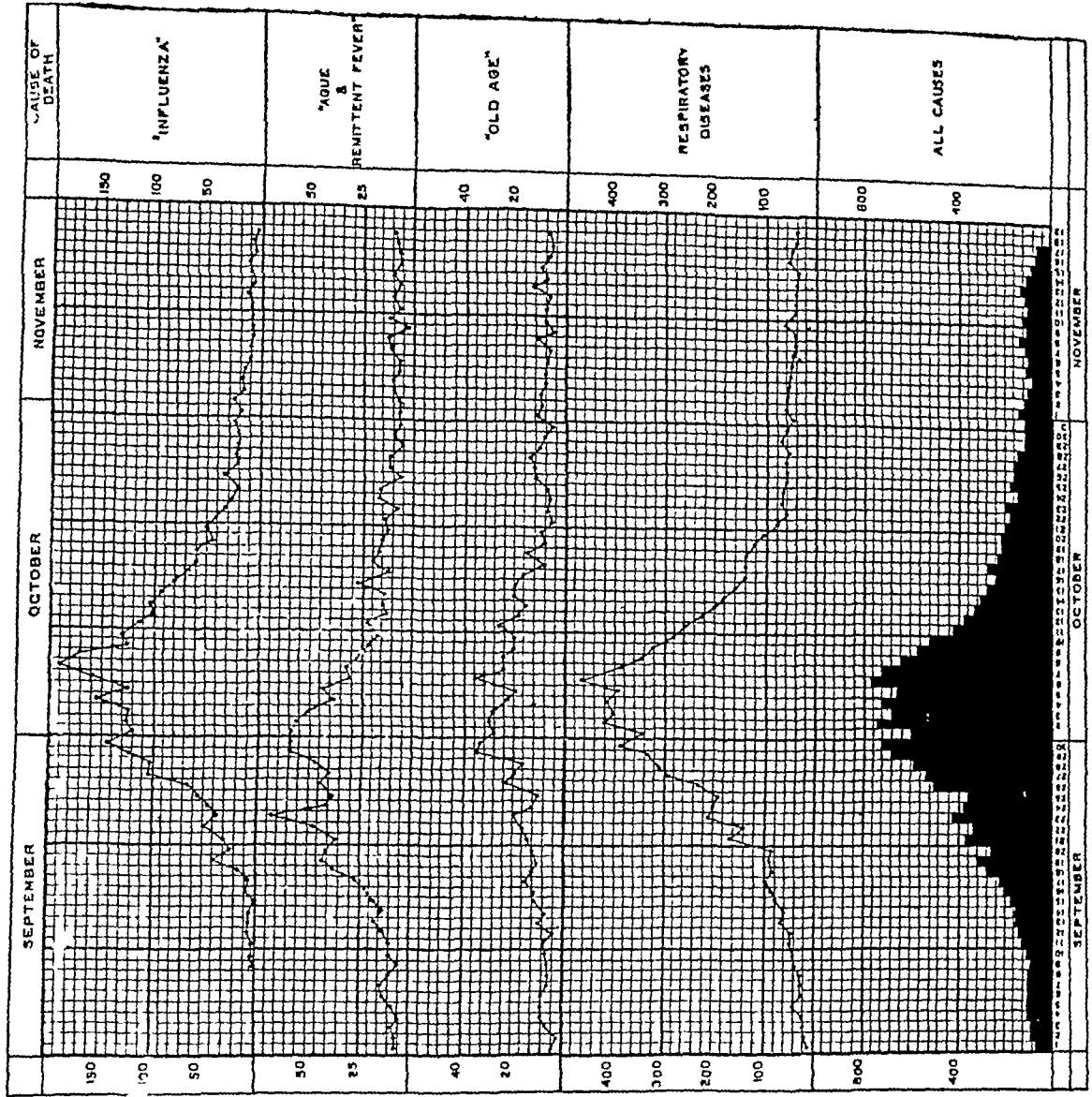


CHART IV

Shewing the effect of the epidemic on mortality from various causes in Bombay City, September 1st—November 16th, 1918



fidelity the order, and to a marked extent the degree in which mortality generally affects the individual communities which make up the heterogeneous population of Bombay. In other words those communities whose collective hold on life is known to be slight suffered most during the epidemic, and the converse holds also. The relatively slight mortality among Europeans is very marked whilst the havoc that the epidemic wrought among low caste Hindus is equally striking, the more so when it is realized that it is this community which consists in the main of the very groups, sweepers and scavengers, who showed themselves almost immune in the first phase of the epidemic.

The order of mortality among the communities quoted above is, in general terms, the order in which one would place the communities as regards general enlightenment, education and approximation to Western methods of life. The order among communities is, no doubt, the result of the interaction of a highly complex group of factors, but it certainly suggests that education and Western influence have, from this stand-point, a beneficent effect on an Indian population.

12 *The problems of prevention and control in an Oriental City such as Bombay*—These are problems which have exercised the minds of sanitarians for the past three decades. The present position can hardly be regarded as satisfactory, for there are numerous highly important epidemiological questions connected with them which are as yet unanswered. Our knowledge of the bacteriology of the disease, for example, is admittedly far from complete, we are in almost complete ignorance of the epidemiological factors which determine the change of character of the disease from endemic to epidemic and from mild to intensely virulent, we can marvel at the rapidity with which the disease spreads over the face of the earth, but even modern facilities for rapid human intercourse do not supply an altogether adequate explanation. We do not at present know why the month of October 1918 was a period of greatly enhanced virulence in such widely separated places as the United Kingdom, France, Germany, Switzerland, Tangier, Sierra Leone, South Africa, Canada, the United States, Aden, Persia, Afghanistan and all parts of India, or how to account for the almost exact synchronization of these virulent outbreaks in places so diverse in climatic and other conditions. Until these and other questions are answered we are not in a position to devise measures of control based on any true conception of the disease. If we are unable to escape its incidence,—and it will be conceded that hitherto no country and no city which has lain in the natural path of influenza in its pandemic form has succeed-

ed in doing so,—we can at least devise measures to mitigate the horrors of its progress and in some degree, perhaps, to curtail its ravages. Such measures as are applicable to a teeming oriental city such as Bombay may be considered as follows —

I The organisation of an International Bureau of Public Health, to keep in touch with influenza incidence and mortality throughout the world and to give timely warning to all governments of the development of an epidemic. Doubtless the recently constituted Bureau Internationale d'Hygiene Publique will fulfil this most important function in the future.

II Quarantine. It is the general opinion that quarantine to prevent the importation of influenza is impracticable. A system of quarantine was imposed in Australia in 1918 but it was found to be ineffective and was soon abandoned. Isolation and quarantine may possibly be effective in small isolated communities. The reports of Dr Parson⁷ show how lighthouses and certain institutions have been known in the past to escape the epidemic entirely, even when it is severely prevalent in neighbouring districts. The application of preventive measures on a large scale is fraught with great practical difficulties and it does not appear likely that the isolation of patients on a scale sufficiently large to affect the incidence materially could ever be introduced. The isolation in hospitals of severe cases complicated with pneumonia is on a different footing, and no effort should be spared to ensure its accomplishment on as large a scale as possible. Newsholme's views on isolation written in 1907 are still applicable "the public are becoming familiar with the idea of the infectivity of influenza and we may hope that the public health conscience of the community will in time be braced up to the point of the self-sacrifice involved in the non-compulsory isolation which this case demands"⁸. If this prospect seems remote in England it is almost Utopian in Bombay where the "public health conscience" is a plant of very tender growth though it must be acknowledged that never before, perhaps, in the history of India have the educated and more fortunately placed members of the community come forward in such large numbers to help their poorer brethren in time of distress.

III Notification. This is not likely to be of any great service in the control of an Indian epidemic, for it is impossible in the case of the vast bulk of the population who in case of illness are medically attended, if at all, by indigenous practitioners of Eastern systems of medicine.

IV Improvement of methods of registration of mortality statistics. This is of far more importance and in cities would well repay the

expense involved in re-organization of existing methods. In rural districts of India deaths are recorded under six main heads (which do not include influenza); the reporting agency, usually the village head-man, is of course completely ignorant of medicine and many of them are hardly literate. Returns from such sources are almost valueless statistically, but they constitute, nevertheless, the bulk of the data on which the mortality statistics of India are compiled.

In Bombay, as in a few other large cities, it is possible to proceed a step further and attempt to classify every uncertified death, at any rate in normal times, by personal enquiries from the relatives of the deceased, but the medical men who carry out this work are not highly trained and ill-paid and work in any case at a profound disadvantage in not having seen the patient during life. Further progress should, in the writer's opinion, be in the direction of providing a greater number of well-trained Indian doctors, adequately paid or subsidised from municipal funds, whose primary duty would consist of free domiciliary treatment for the poorer classes of Indians. This would tend to the gradual abolition of the system of guess-work now in vogue, and to substitution of notification of death by the medical attendant.

V Methods of publicity. In a population which is largely illiterate, such methods have but a limited value, but advice should be given on simple precautions calculated to maintain the health and resistance of the individual and to diminish the opportunities of infection, such as the avoidance of crowded gatherings, the importance of free ventilation, the disinfection of the discharges from nose and mouth and the early isolation, where possible, of the sick.

It is of greater importance that a municipal authority should make widely known all emergency arrangements which have been made locally, such as special arrangements for the provision of domiciliary medical attendance, the location of temporary dispensaries and facilities for obtaining medicines and especially milk, which is a prime necessity in the case of the poorer classes of Indians. Details should also be given of hospital accommodation available in the district and particulars of ambulance and nursing services that may be feasible.

VI Protection of medical and nursing personnel. One of the most tragic features of the epidemic, both in Bombay and India as a whole, was the mortality amongst medical men and nurses working in hospitals, and in order to economise this irreplaceable personnel in a future epidemic the writer would urge that at the earliest indication of an outbreak every effort should be made to induce all such personnel, particularly Indians, to avail themselves of every means which science can

suggest to protect themselves from infection. This might include inoculation with a suitable vaccine, the use of masks when actually in attendance on patients and the employment of the precautions which ought to be observed in treating cases of any acute infectious disease. Regular douching of the naso-pharynx with isotonic salt solution, aqueous thymol solution or other mild antiseptic should be advocated. It is pre-eminently in such cases that individual methods of prophylaxis may be applied with the greatest prospect of success and success in an individual of this group is of manifest advantage to the community as a whole. Individual prophylaxis on such lines does not however, commend itself to the writer as a method capable of general application in an Indian population. It need not be said, however that advice on and facilities for the practice of personal prophylaxis with any modifications and improvements that the advance of science may bring to light, should be made available to the enlightened public.

In regard to vaccine prophylaxis in particular, the writer has an open mind. There is at present no little divergence of opinion as to the constitution of a suitable vaccine and our knowledge of the degree and duration of immunity conferred by the inoculation is almost nil. It would seem, therefore, that this is a question which should await the considered verdict of scientific workers in all parts of the world. Governments and local authorities in India, which already have sufficient difficulty in introducing among an unwilling populace prophylactic inoculations of unquestioned value for small-pox, plague, cholera and diseases of the enteric group, would do well to pause before committing themselves to the wholesale advocacy of a measure, the utility of which is still *sub judice*.

VII Closure of schools and cinemas. School closure is a method of questionable value in a city like Bombay where the schools generally speaking offer a healthier environment than the homes of the pupils and where, moreover, excluded children have almost as much opportunity of coming in contact with each other as if they were at school. On the other hand, modern school buildings can often be adapted as temporary hospitals with considerable success and this point must be taken into consideration.

Cinemas, however, constitute a much more real danger to the community. The cinemas of Bombay are very numerous and afford a cheap and exceedingly popular form of entertainment for the masses. The Bombay cinemas realize the almost perfect medium for the interchange of microbic infections, they are dark, inadequately ventilated and the atmosphere is invariably warm and humid. They commonly have several performances every evening with no intervals for the cleansing

and perfilation of the building. Municipal legislation exists for the closure of licensed places of entertainment but large interests are at stake and compensation, if payable, would involve a heavy expense. The responsibility of local authorities in cases such as this needs to be legally defined. It would certainly be practicable to limit the number of performances to allow of intervals for proper ventilation.

VIII The organisation of a domiciliary nursing service. This is scarcely feasible in Bombay under present conditions, owing to the extreme shortage of personnel suitable for the purpose and to popular prejudice. The caste system and the unjustifiably low esteem in which Indian nurses are held combine to render domiciliary nursing a matter of great practical difficulty. The provision of milk, an article of diet which is highly prized though almost unknown to the poor of Bombay, the provision of clothing, blankets and "pneumonia jackets" from a large number of readily accessible centres in the heart of the city is a more practicable and acceptable means of bringing relief to the homes of the poor.

IX The provision of institutional treatment on a large scale affords in the writer's opinion one of the most efficient methods of reducing mortality. It has the great advantage of economising medical personnel, it insures as far as possible that public or other funds allocated for relief measures will be expended to the best advantage, it provides for the isolation of highly infective cases which could not without the greatest danger to other members of a family, be treated in the noisome single-roomed tenements ten feet square or less which serve as habitations for thousands of families in Bombay, and lastly it offers the patients themselves the best chance of recovery.

It was one of the most encouraging experiences of the epidemic to see the apparently desperate cases that recovered when properly nursed and cared for. The elementary school of the future might well be designed with a view to possible adaptation as a hospital in case of a serious emergency such as arose in 1918. Experience has shown how little is required to adapt a modern school building to hospital use and a few minor variations in initial design, for instance such as increased width of staircases to facilitate the handling of stretchers would add very little to their initial cost and very much to their utility as emergency hospitals. The writer's view is that it is on the lines of institutional treatment that the large cities of India would do well to concentrate their attention on the recurrence of an epidemic. In the meantime much might be done to popularise hospital treatment in general by raising the standard of treatment and of comfort in hospitals for the poorer classes and thus overcome the dis-

inclination of Indians to leave their homes. This prejudice is already on the wane in India and in time there is no reason why it should not largely disappear.

Conclusion—The amelioration of the appalling housing conditions which characterise the slums of Bombay and the raising of the general standard of living are sanitary and sociological considerations of the highest importance, but these are larger questions than can be considered in the present instance and, in the writer's opinion, the next visitation of influenza may be expected before any great progress can be made in these directions.

It has been the writer's endeavour to present the features of the 1918 epidemic of influenza in Bombay, and to indicate the lines on which action ought to be taken in the immediate future. The Bombay of a century hence presents such vistas of possibility, political and sociological, that the mind can scarcely envisage them.

The path of the sanitary reformer in India is beset on every hand with difficulties and discouragement, and yet, if his work is to be really effective it must depend ultimately on the pressure of public opinion. It has been said that there is a soul of good in things evil and if the experiences of 1918 have brought home to those voluntary workers, especially educated Indians of all classes who rendered such splendid service in a time of unprecedented stress, the distressing conditions under which the poor of Bombay continue to exist it may be that Bombay may have in store for her a brighter history in the future than she has known in the past. In whatever hands her future destinies may lie let us hope that the lessons of 1918, so hardly learnt, will not be easily forgotten.

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* NOTE.—The writer desires to record his indebtedness to the late Dr J. A. Turner, C.I.E., late Executive Health Officer, Bombay Municipality, for permission to make use of the records of the department under his charge.

TABLE I.

Bombay City 1st Phase, June 10th—July 23rd, 1918

Statement showing incidence of the epidemic among the employees of several leading firms, offices, mills, etc, in order of incidence amongst Indians

Serial No	Name of Firm	No of European employees	No of Indian employees	No of Europeans attacked	No of Indians attacked	Date of first case	INCIDENCE PERCENTAGE AMONG EMPLOYEES	
							Indians	Europeans
1	Green's Restaurant	1	173		100	June 25th	58	0
2	Kohinoor Mills, Dadar	5	2,600		1,300	" 25th	50	0
3	Schools		8,891		4,283	" "	48	0
4	W & A Graham & Co	12	270	3	127	" 15th	47	25
5	H M Mint	25	1,380	10	635	" 19th	46	40
6	Rachel Sassoon Mill	2	2,057	1	916	" 20th	45	50
7	G I P Ry, Parel (Loco)	30	7,012	45	3,082	" 21st	44	15
8	Bank of Bombay	14	307	2	125	" 22nd	41	14
9	Kastoorchand Mills	5	1,689		660	" 24th	39	0
10	Taj Mahal Hotel	3	575		220	" 22nd	38	0
11	Whiteaway, Laidlaw & Co	10	66	3	25	" 22nd	38	30
12	Hongkong and Shanghai Banking Corpn	5	75	1	27	" 17th	36	20
13	Bombay Port Trust	223	11,813	59	4,179	" 17th	35	26
14	National Bank	13	270	5	92	" 23rd	34	38
15	G I P Ry, Matunga	104	6,450	12	2,192	" 24th	34	12
16	Colaba Land & Mill Co	1	2,425		809	" 24th	33	0
17	Heatly & Gresham Ltd	5	23	2	7	" 21st	30	40
18	B E S & T Co, Ltd	25	3,400	3	900	" 23rd	26	12
19	Police		2,900		715	" 10th	25	0
20	Morarji Goculdas Mills	3	3,242		824	" 25th	25	0
21	R I M Dockyard	129	8,394	28	2,039	" 16th	24	22
22	Textile Mills	8	3,000	3	679	" 24th	23	37
23	Post Office		2,179		501	" 22nd	23	0
24	Simplex Mills	1	2,150		500	" 24th	23	0
25	Telegraph Department	421	775	68	164	" 18th	21	16
26	Currumbhoy Mills	3	3,491		660	" 24th	19	0
27	Maneckjee Pett Mills	1	4,675		787	" 24th	17	0
28	Standard Mills		2,419		396	" 24th	16	0
29	Jacob Sassoon Mills	7	4,413		665	" 22nd	15	0
30	Health Department Bigaries		4,698		418	" "	9	0
31	David Mills Co	3	2,900		244	" 21st	8	0
32	Health Department Halalkhores (Sweepers)		2,389		88	" 21st	4	0
TOTAL		1,329	97,100	245	28,359		29	18

TABLE II

Bombay City 1st Phase, June 10th—July 23rd, 1918

Statement showing the dates on which the first cases occurred in various offices and firms

Serial No	Date of first case	Office or Firm	WARD IN WHICH OFFICE OR FIRM IS SITUATED	
			Ward	Section
1	11th June	Police	A	Fort North
2	15th "	W & A Graham & Co	A	Fort South
3	16th "	R I M Dockyard		
4	17th "	Bombay Port Trust	A	Fort North
5	" "	Hongkong and Shanghai Banking Corporation		
6	18th "	Telegraph Department	A	Fort North
7	19th "	H M Mint	E	Tarwady
8	20th "	Rachel Sassoon Mill	A	Esplanade
9	21st "	Heatly and Gresham Ltd	G	World
10	" "	David Mills Co	F	Parel
11	" "	G I P Ry, Parel (Loco Dept)		
12	22nd "	Post Office	F	Parel
13	" "	Jacob Sassoon Mills	A	Esplanade
14	" "	Whiteaway, Laidlaw & Co	A	Fort South
15	" "	Bank of Bombay	A	Lower Colaba
16	" "	Taj Mahal Hotel		

TABLE II—(contd)

Serial No	Date of first case	Office or Firm	WARD IN WHICH OFFICE OR FIRM IS SITUATED	
			Ward	Section.
17	23rd June	B. E. S. & T. Co., Ltd	A	Lower Colaba
18	" "	National Bank	A	Esplanade
19	24th "	Currimbhoy Mills	G	Worli
20	" "	Standard Mills	G	Worli
21	" "	Textile Mills	G	Worli
22	" "	Simplex Mills	E	Biculla
23	" "	Maneckjee Petit Mills	E	Tardeo
24	" "	Kastoorchand Mills	G	Worli
25	" "	Colaba Land and Mill Co	A	Lower Colaba
26	" "	G. I. P. Ry., Matunga	G	Mahim
27	25th "	Kohinoor Mills	F	Sion
28	" "	Green's Restaurant	A	Lower Colaba
29	" "	Morari Goculdas Mills	F	Parel

SUMMARY

	Nationality	Total No. Employed	Total No. attacked	Incidence Percentage.
1	Indians	97,100	28,359	29
2	Europeans	1,329	245	18

TABLE III

Bombay City 1st Phase, June 10th—July 23rd, 1918

Statement showing incidence of the epidemic among certain schools in Bombay City

Serial No	Name of School	No of boys	No of boys affected	No of girls	No of girls affected	Incidence percentage among boys and girls together
1	Wilson High School	475	333			70
2	Elphinstone Middle School	636	380			60
3	Aryan Education Society's High School	989	552			57
4	Elphinstone High School	648	367			57
5	St Xavier's High School	1,169	608			52
6	General Education Institute, Dadar	819	422			52
7	Maratha High School	329	166			50
8	Antonio De Souza's School	239	119			50
9	A. da Silva High School	418	200	71	36	48
10	Goan Union High School	700	320			46
11	Parsee Girls' School Association			255	107	42
12	Anjuman-i-Islam School	172	69			40
13	Alexandra Girls' English Institution			207	79	38
14	Sir J. J. Parsee Benevolent Institution	512	197			38
15	American Marathi Mission Schools	102	40	67	21	36
16	Sir J. J. School of Arts	392	131			33
17	Robert Money School	324	80			25
18	Bombay Education Society Girls' School			93	19	20
19	Cathedral Girls' High School			197	37	19
20	Indo British Institution			45	Nil	All boarders
	TOTAL	7,956	3,984	935	299	48

SUMMARY

Sex.	Total No. of pupils	Total No. attacked	Incidence percentage
Boys	7,956	3,984	50
Girls	935	299	32
Boys and Girls	8,891	4,283	48

TABLE IV

Bombay City 1st Phase, June 10th—July 23rd, 1918

Age and Sex Incidence among 3,000 cases of simple fever treated at municipal dispensaries

(1) Sex

District Number	Males	Females	TOTAL
1	164	32	196
2	241	60	301
3	367	180	547
4	119	36	155
5	235	119	354
6	190	60	250
7	235	120	355
8	204	73	277
9	169	69	238
10	219	52	271
GRAND TOTAL	2,143	801	2,944
Percentage to total number of cases *	72.79	27.21	

TABLE V

Bombay City 1st Phase, June 10th—July 23rd, 1918

Age and Sex Incidence among 3,000 cases of simple fever treated at municipal dispensaries

(2) Age

District Number	0-10 years	11-20 years	21-30 years	31-40 years	41-50 years	51-60 years	61-70 years	71-80 years and over	TOTAL
1	38	39	63	29	15	8	4		196
2	60	105	69	34	23	6	3	1	301
3	181	102	114	70	60	15	4	1	547
4	5	25	50	15	9	10	25	16	155
5	95	54	85	73	34	11	2		354
6	30	60	89	49	19	3			250
7	70	93	77	58	41	16			355
8	52	65	94	40	20	5	1		277
9	63	46	77	34	12	6			238
10	44	59	85	57	20	6			271
GRAND TOTAL	638	648	803	459	253	86	39	18	2,944
Percentage to total number of cases *	21.67	22.01	27.28	15.59	8.59	2.92	1.33	6.1	

* It is to be observed that the age and sex proportions of the dispensary attending population are not necessarily those of the general population, and hence these figures do not represent age and sex incidence

ARTIFICIAL PNEUMOTHORAX AND OTHER SURGICAL METHODS IN ADVANCED TUBERCULOSIS AND PLEURISY

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DURING a little more than two years work in India the author has had the opportunity of

observing the considerable differences between the conditions of sanatorium work in India and in Europe. The data resulting from this difference are of much interest for the further development of the sanatorium movement in India. A detailed discussion of these data, however, would claim more space than can be given to such a subject by a general medical journal. But a certain portion of the work during these few years is of such a particular kind as to make the author, on his departure from India, feel not only justified but obliged to render a report thereof to the medical profession in India.

This obligation is not explained by marvellous results in surgical activity against pulmonary tuberculosis. The 90 cases in which such treatment has been carried out have all been so advanced that any other kind of treatment was really not possible. Artificial pneumothorax is not to be considered as an unfailing and infallible remedy for all forms of pulmonary tuberculosis. But just because the specific treatment (whether of bio- or chemo-specific nature) has turned out, so far, to be more or less a failure, there is good reason for adopting the modern surgical methods as a help in such cases in which sanatorium treatment alone is not sufficient to secure a lasting positive result.

While at the very beginning of our discussion these limitations have been mentioned, there are, however, other reasons for calling attention to this question. The pneumothorax idea has brought about a new era in the study of many phenomena the importance of which had hitherto been overlooked. New light has been thrown upon many interesting physiological questions with regard to the thorax and its organs. New diagnostic methods invented through this particular form of treatment have allowed a more exact localisation and precise diagnosis of the individual affections concerned with regard to extent and activity. The great advance in diagnosis by the use of X-rays was to a large extent developed along with surgical experiments. The exact measuring of the intra-thoracic pressure, as one of the essential principles in pneumothorax treatment has opened up new ways for the treatment of pleural complications such as pleurisy and spontaneous pneumothorax.

These are some of the beneficial attributes which have secured to "collapse-therapie" a permanent share in the fight against tuberculosis and have been responsible for the publication of more than a thousand articles and books by scientists all over the world.

Theories on the effect—When the Italian genius Forlanini suggested artificial pneumothorax it was from the simple observation that natural healing of a tuberculous lung takes place through retraction. When nature fails, this is often due to the comparatively narrow limits of the stiff chest wall, and that only a very limited dislocation of mediastinum, heart and diaphragm is possible. It seems very reasonable, then, to establish a condition in which the lung retraction can be induced to any necessary extent. This condition is provided when, through the introduction of air into the pleura, the lung is allowed to withdraw from the parietal pleura.

Further experiments have added to this original theory other observations, perhaps of still more importance. It was seen how even the biggest cavities, the healing of which could not be expected by any amount of retraction, were caused to heal by the actual compression of the ulcerated walls by the pneumothorax. Being brought into contact with each other the sides of the cavities

united together, the abscess was changed into a solid ulceration, and the connective tissue was allowed to enter and to transform the previously discharging cavity into a solid scar. It was also observed how the steadily increasing tubercular process was often stopped by the immobilisation afforded by the pneumothorax. It is a well known fact that surgical tuberculosis benefits by immobilisation. The decreased expansion on the affected side might also here indicate a natural effort of healing. But effective immobilisation is only provided when the lung retires from its function for a sufficiently long time to allow the demarcation to take place. Practically the pneumothorax may be compared to a bandage on the diseased lung.

Finally, anatomical analysis as well as clinical experience show that the collapse leaves the lung in a condition of venous and lymphatic stasis. Through the venous stasis the lung is benefiting by the same factors as in Bier's treatment. Lymphatic stasis is the only explanation of the very striking dis-intoxication which is occasionally observed in successful cases, and the immediate fall of temperature to normal.

Physiological and anatomical possibilities—The question is now, how far is it possible to practise lung collapse without causing serious complications?

From a physiological point of view there is no definite objection. Like other coupled organs, *e.g.*, the kidneys, the lungs provide sufficient reserve capacity to enable the system to neutralise the effect of exclusion of one lung from the respiratory and circulatory functions. The initial breathlessness is not of any serious nature. The heart does not show any remarkable reaction to the considerable change in the pulmonary circulation.

The well known danger of accidental and spontaneous pneumothorax does not occur in cases of artificial pneumothorax.

From an anatomical point of view there would be no hindrance to establishing a complete pneumothorax in normal individuals. The negative intra-thoracic pressure is the only cause that keeps the elastic lung tissue in its expanded condition by which air is inhaled into the alveolæ. Introduction of a sufficient amount of air into the pleura to neutralise this negative pressure produces a complete collapse of the lung.

Somewhat different conditions meet us when the lung is changed by an advanced affection. The infiltration fibrosis and destruction have to some extent diminished the elasticity of the lung, and a complete collapse can only be obtained by a more or less positive pressure in a pneumothorax, by which the lung is forced to collapse against the rigidity of its tissue.

A still more important factor is to be faced. The state of the pleura in the majority of advanced tubercular cases is changed by its participation in the inflammatory process of the lung.

The pleura is already partially or completely destroyed and replaced by organised adhesions. Even in cases with no history whatsoever of pleuritic symptoms the whole pleura may be found obliterated in this way. Experience shows that in less than 20 per cent of "third stage" cases do we find the affection so located to the deeper parts of the lung tissue as to leave the pleura intact. Between the two extremes of complete adhesion and completely intact pleura all degrees of transition are possible, and it is impossible beforehand to know how to classify the case. Localised adhesions may be found anywhere covering a lobe or a part of a lobe, or in the shape of strings or bands from the surface of the lung to the chest wall. Naturally this fact interferes in the most distressing way with the treatment, hampering its effects making the technique very complicated and influencing the results even in the most experienced hands. It is not surprising therefore, that those scientists who had understood the value of lung collapse and had reaped its results in successful pneumothorax cases, have exerted themselves to improve the technique and to find out new ways of rendering help to such patients as could not be successfully treated with pneumothorax treatment on account of adhesions. While all previous attempts at treating this disease by operation have turned out a failure, the modern principles of lung collapse have opened up a new scope for surgery which will be briefly dealt with at the end of this article.

Indications—In spite of the difficulties mentioned above, the indications for producing artificial pneumothorax still claim a considerable field.

The fact that lung collapse is applicable only in *unilateral cases* might seem to make its value rather doubtful, inasmuch as according to special experience almost no advanced case of lung tuberculosis is strictly unilateral. Although examination will in almost all cases reveal dullness and adventitious sounds in the less affected lung, further exact methods of diagnosis will often enable us to settle the indications for pneumothorax. Firstly, the adventitious sounds in the less affected lung may be "transferred sounds," the origin of which is to be found in the more affected lung. The character of such transferred sounds will often be easily recognised, but in some cases a repeated careful stethoscopic examination compared with X-ray examination is necessary in order to settle the origin of the sounds. Secondly, even if such sounds evidently belong to the better lung, this does not always mean that this lung is actually affected. Even in evidently arrested lung affections some adventitious sounds will sometimes be heard due to an old, inactive healed process (scar sounds). And thirdly, experience has shown that even in cases with a limited affection of the better lung the patient may benefit by a collapse of the more active and more advanced lung. Far from being seriously injured, the lung that is left behind for single-hand work often showed a striking improvement during the course

of pneumothorax treatment. This of course does not mean that any advanced or more active affection of the better lung is not a contra-indication.

In the cases under review the indications for pneumothorax were restricted (by the lack of X-rays) to such cases where either the unilateral character of the affection was evident or where no room was left for ordinary sanatorium treatment. In all cases the pneumothorax treatment was applied only after an unsuccessful trial with the usual sanatorium régime for a reasonable period of time.

Dosage, Technique, Complications—The air that was injected was in all cases atmospheric air (for want of nitrogen, which is more reliable with regard to absorption). The quantity of air varied according to the need and the particular circumstances of the individual cases. No rules can be fixed with regard to dosage. The observations during the course of treatment concerning the capacity of the pleura, the presence of local adhesions, the effect upon the local and the general symptoms, etc., have guided the dosage in each individual case. The lack of X-rays was a very serious handicap in the observation of all these details. The height to which the intrathoracic pressure was brought up by the injections varied from about 0 to 40 cms of water pressure.

On the first injection a dose of only 200 to 300 c.c. of air was ordinarily given. The following day 300 to 500 c.c., afterwards one or two days were added to the interval between successive injections, until the intervals reached three or four weeks or even more. In this way the collapse of the lung was established gradually and later on kept as stationary as possible. The gradual decrease of the resorptive power of the pleura during the treatment enables us to carry on with increasing intervals.

In the majority of cases the treatment is still being continued, but some of these patients have been discharged from the sanatorium and are now being treated in their own homes. Ordinarily it is necessary to continue the pneumothorax treatment for at least a couple of years, especially in dealing with old chronic cases of destructive tuberculosis. Only in cases of more fresh and superficial affection is a shorter course of treatment sufficient (*vide* case 3).

In a few of the recorded cases the treatment was discontinued after a few injections as the special indication in such cases was a chronic dry pleurisy with friction sounds (*vide* cases 4 and 13), a short separation of the rubbing pleural surfaces was enough in these cases to stop the pleuritic symptoms.

The question of duration of the treatment has to be settled in each single case according to individual circumstances. After stopping the treatment the patients were kept under close observation so as to enable us to begin the treatment again if the gradual expansion of the lungs should cause any sign of activity. When once the collapsed lung has entirely expanded it will not be possible

to reproduce a pneumothorax, and universal adhesions will take place between the expanding lung and the chest wall. The *technique* of the operation was according to Saugman's method. Many modifications have been suggested with regard to apparatus, needles and technique. An ordinary siphon system with manometer joined on to the tube from the reservoir to the needle has been used by us. The type of needle used for the first injection was the Saugman's pneumothorax needle, for the further injections Kjer-Petersen's needle was used,—(this needle is closed at the end and has its $\frac{1}{4}$ inch long opening on the side of the needle, just near to its end). The re-injections do not cause any technical difficulties, but the first injection has to be carried out very carefully with an accurate knowledge of the physiological conditions in the thorax and with a thorough familiarity with all technical details, as any mistake may involve considerable danger to the patient.

It is of cardinal importance never to allow any air to enter through the needle until the manometric movements show that the opening of the needle is in free pleura. If any air is forced in before the manometer shows the typical reaction, the air might enter into a blood vessel and cause serious embolism. The manometer during the whole operation is always kept in open connection with the needle.

The first injection is usually given under local anaesthesia of the different layers of the chest wall, preferably in the fifth intercostal interspace and in the mid-axillary line, after an injection of morphia ($\frac{1}{2}$ gram). Though no local anaesthetic was given at the re-injection, no serious pain or trouble was caused to the patients.

Scrupulous asepsis is necessary. The needles and the cotton filters, by which the air is sterilised on its passage from the reservoir to the needle, are kept in a dry sterilised condition with formalin.

No serious complications took place in any of the cases under review. Of a more troublesome rather than serious nature was the complication of pleurisy with effusion in the pneumothorax. This complication was observed in about 50 per cent of the cases and the same frequency is observed by other authors. Without causing any harmful effect on the general condition, this complication sometimes gives an indication for aspiration on account of its disturbing influence upon the equilibrium of the lung. In several cases the effusion caused secondary adhesions with considerable difficulties in a continuance of treatment. In one case this complication made it impossible to continue the injections at all.

Results—It is as yet too early to make any final statement upon the results in these cases, as many of them are still at the beginning of the treatment and none have been observed for a sufficiently long time to give a reliable idea about the lasting effect. At the present stage, however, the author feels justified in putting forward statistics which are the result of three years of research work and

to add to them a few notes with regard to the cases under review.

The author has had the opportunity of studying under Professor Saugman at Vejlefjord Sanatorium, Denmark, the largest number of cases regarding which results have hitherto been published, namely about 400 "third stage" cases treated with artificial pneumothorax. This material deals with cases which had been discharged from the sanatorium 3 to 13 years before the statistics were collected. The material falls into two groups which are to be considered equal with regard to extent and prognosis of the disease. One group includes cases in which practically no pneumothorax was applicable on account of pleural adhesions. The state of the patients of this group, at the time of the statistical examination showed that only about 10 per cent were capable of work, the remaining 90 per cent had either died or were still suffering from the disease. The other group includes all cases in which a total or partial pneumothorax had been carried out. Of this group about 35 per cent were capable of work at the time that the statistical examination was made.

The difference between these two groups speaks emphatically enough in favour of the pneumothorax treatment, though none of the temporary results are taken into consideration. But a closer observation of the last group reveals the fact that still better results might have been attained if more or less localised adhesions had not exerted their effects, especially if, in this group, we confine our attention to those cases in which practically no adhesions were observed, the capability of work after 3 to 13 years' observation was not less than 70 per cent—a percentage that will scarcely be met with in any other treatment for third stage cases of pulmonary phthisis.

Sanatorium work in India makes one feel somewhat doubtful as to the possibility of reaching similar results. Several circumstances seem to handicap the treatment of all kinds of tubercular diseases in this country. The cases that come under treatment seem to show on an average more active disease and less power of resistance than in Europe. This is probably due to a great extent to the fact that many more complications are observed in this country than in western countries. Tropical fevers and their after-effects, syphilis and insanitary conditions weaken the power of resistance to such an extent as to severely handicap all work amongst tubercular patients in India. In all probability under such circumstances, the result of pneumothorax treatment in this country will be proportionately limited. Moreover, pneumothorax work in this sanatorium has been handicapped by the lack of X-ray examinations which are almost indispensable in obtaining the best possible results.

The following is a statement of the results obtained during the last two years at this sanatorium—

90 cases were considered to be fit for pneumo-

thorax treatment according to the above mentioned indications

In 28 of these cases it was impossible to apply pneumothorax treatment on account of universal adhesions (This group may include some few cases in which X-ray screening would have made it possible to induce a partial pneumothorax)

Of the remaining 62 cases, in which it was possible to induce a pneumothorax, one patient left the sanatorium for private reasons after a few injections, and 7 have been started so recently that it is still impossible to form any judgment about the results. Of these 7 some give good reasons to expect a positive result.

54 cases are left for further discussion. 34 of these cases proved unsuccessful, either on account of adhesions or strong activity of the disease, and so the treatment was given up after a very temporary beneficial effect. In 20 cases the result has so far been positive.

Short record of 20 cases with positive results —

(1) Female—Total affection of left lung with cavity in apex, slight affection of right apex, low chronic fever. First injection 26-1-21. Discharged 20-10-21, much improved, T B O* (later on occasionally a few T B found). Treatment continued, ambulant, condition good.

(2) Male—Total affection of right lung, commencing cavity in apex, irregular fever. First injection 7-3-21. Discharged 10-12-21, much improved, T B O. Pneumothorax continued, ambulant for short time after discharge. Re-admitted 1-6-22 to 24-8-22, treatment stopped after 17 injections in all. No symptoms.

(3) Male—Left lung affected throughout with fresh process. Dry pleurisy with friction sounds all over. Fever. First injection 14-3-21. Discharged 6-12-21, much improved, T B O. Treatment continued for a few months, ambulant, stopped after 19 injections, May 22. Doing medical work, no symptoms.

(4) Female—In this case the condition present was a chronic, dry pleurisy with permanent friction sounds. First injection 29-3-21. After 3 injections the pneumothorax was stopped. Patient discharged 9-8-21, slightly improved.

(5) Male—The whole of right lung involved in a destructive process. Back wall of the larynx ulcerated, chronic low fever. First injection 8-4-21. Still under treatment, much improved, T B O. Larynx healed, complicated with serious effusion which was evacuated twice. Walks about.

(6) Male—Double affection with râles all over both lungs, big cavity in right apex. Frequent hæmoptysis. First injection (during hæmoptysis) 7-6-22, treatment stopped after 29 injections. Discharged 7-6-22, improved. T B +, occasionally coloured sputum, lingering at home.

(7) Male—Re-admitted case with destruction all over left lung, chronic fibrous affection in upper half of right lung. Left vocal cord infiltrated. High fever. First injection 1-7-21, still under treatment. T B +, no fever, walking about.

(8) Female—Acute destructive affection all over left lung, a few râles in right apex. High fever. First injection 4-7-21, pneumothorax stopped after 13 injections. Discharged 29-9-22, much improved, T B O, weight increased by 72 lbs.

(9) Female—Chronic affection with cavity in left apex, frequent attacks of fever. First injection 7-7-21, still under treatment much improved, T B O. Walking about.

(10) Male—Acute destructive process all over left lung. Fever. First injection 8-7-21. Still under treatment. The effect delayed by a localised adhesion. Thoracoscopic examination tried with failure. Later

on pleural effusion. Signs of activity in the right lung (+ fremitus). Now much improved, T B O. Walking about without fever.

(11) Male—Pleurisy with effusion on left side, fluid withdrawn, replaced by air, pleurisy subsided later on developed dry pleurisy with chronic fremitus on right side. For this 4 injections were given. Discharged 29-12-22 with no fever, improved condition.

(12) Male—Right lung affected all over, cavity in apex, high fever. First injection 28-11-21. Discharged 7-12-22 much improved, no fever. Still a little morning sputum (T B +) on account of adhesions. Treatment continued, ambulant.

(13) Male—Indication, chronic, dry pleurisy. After 4 injections treatment stopped, no more pleuritic sounds. Discharged 31-8-22, much improved, working.

(14) Male—Right lung affected throughout. During summer of 1921 an acute broncho-pneumonia in left axillary region. When this affection had cleared off first injection was given 2-1-22. Temperature dropped to normal at once. Discharged 28-10-22, much improved, T B O. Pneumothorax continued, ambulant, condition good.

(15) Male—Old bilateral affection treated for several years without effect. At his own insistent request pneumothorax was given on the left, more affected lung. Striking improvement, still under treatment. No fever, T B O. Walking about.

(16) Female—Fresh, acute pneumonic affection all over right lung. First injection 27-3-22. Discharged 31-8-22. Pneumothorax continued, ambulant. Much improved, T B O. Working at home.

(17) Male—Left lung affected throughout, cavity upwards, slight affection in right apex, complication, chronic appendicitis. First injection 16-5-22, still under treatment, much improved, T B O. No fever, walking about.

(18) Female—Left lung affected all over, cavity in apex dense infiltration of lower lobe. Slight affection of right apex. Losing weight, chronic fever. First injection 31-8-22. Still under treatment, but much improved, T B O. No fever, walking about.

(19) Male—Right lung severely affected throughout, slight affection in left apex, advanced laryngeal tuberculosis. First injection 29-11-22, still under treatment, promising prognosis.

(20) Male—On admission the patient was found to be suffering from an advanced pleurisy with extreme dullness all over right side. The dullness was evident also to the left of the sternum and the effusion caused considerable compression of the left lung. The heart was dislocated beating in the left mid-axillary line, severe subjective symptoms (breathlessness and palpitation). Soon after admission 3650 cc (about 8 lbs) of fluid were withdrawn and were replaced by an equal volume of air. Some weeks later a smaller aspiration had to be done in the same way. Since then the fluid has not returned. The heart slowly moved back to its normal place and the subjective symptoms subsided. As, during the expansion the lung developed râles, the pneumothorax was continued, patient still under treatment, improving, no lung symptoms, gaining in weight, walking about.

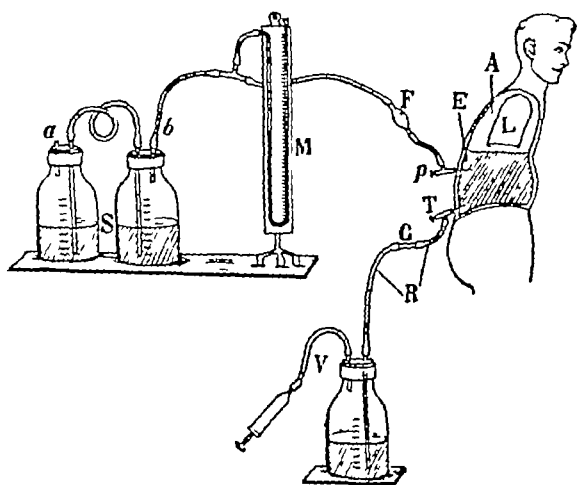
Bearing upon treatment of pleural effusion —
The last case recorded leads us to mention one of the practical bearings of pneumothorax treatment upon other questions. The principles of treatment for pleural effusions have to be thoroughly revised in the light of our knowledge gained through pneumothorax work.

Theoretically, the comparatively good prognosis of an initial pleurisy may be explained by some of the same theories as were mentioned above with regard to the effect of artificial pneumothorax.

The primary lung affection, which is almost sure to be behind, whether it has developed to a

stage where local lung symptoms have been observed or not, is being checked by the effect of the fluid. If this theory be true the leading motive in practical treatment must be to draw the best possible benefit out of this complication. This purpose will in many cases be fulfilled by leaving the fluid without aspiration. The rules which at present guide us as to when a pleural effusion should be aspirated or not do not seem to pay much attention to the facts revealed by pneumothorax treatment.

The following rules have been adopted by us with regard to indications for aspiration—(1) When the fluid causes trouble on account of its pressure upon and dislocation of neighbouring organs (the heart, mediastinum and the other lung, as in the case recorded above) (2) When the effusion causes a prolonged intoxication, weakening the general condition and liable to activate the lung affection through resorption of toxins. This indication will especially be present in cases where diagnostic puncture shows a more or less purulent character of the fluid (3) When the pleurisy occurs as a complication in an advanced affection of the same lung, for which a longer and more effective collapse of the lung is desirable than the one produced by the effusion. In such cases the effusion should be replaced with a pneumothorax before the pleurisy gives rise to unavoidable adhesions which hinder the application on pneumothorax.



Schematic diagram of Combined Pneumothorax and Aspiration Technique

- S Syphon system which acts when the bottle is raised. If more air is required than is contained in one bottle, the rubber tube *b* can be moved over to *a*.
- C Stop cock for opening and closing the connection between pneumothorax trocar *P* and air reservoir.
- M Manometer.
- F Cotton filter through which air is sterilised. When the pneumothorax trocar is above the level of the effusion (E) the respiratory movements will be indicated on the manometer.
- A Injected air.
- L Lung.
- T Aspiration trocar.
- C Glass tube put in between the two rubber tubes *R*.
- V Vacuum system.

Not only the indications for, but also the technique for pneumothorax have to be considered

In all cases where a pneumothorax is indicated we have adopted a technique of aspiration which is a combination of the ordinary Potain's aspiration and a simple pneumothorax technique as seen in the accompanying figure. As the aspiration proceeds an equal amount of air is injected through a separate needle into a higher intercostal space.

This technique offers several advantages. The effusion is withdrawn without an immediate interruption of the useful collapse of the lung. The further treatment of the case can be carried out according to individual needs, whether with or without continued pneumothorax treatment. The operation itself, which can be performed under local anaesthesia and in the sitting posture, affords a complete evacuation of all fluid without any of the troubles and dangers—such as sudden expansion of the lung—which are ordinarily caused by simple aspiration.

The same technique has in several cases proved beneficial in the treatment of empyema. A tuberculous empyema should never be treated by resection of the ribs and open drainage, as the sinuses, after such operations, will ordinarily remain open and will cause a serious condition to the patient. Also, for the serious complication of spontaneous pneumothorax, this technique enables us to so modify the treatment that better attention is paid to all the physiological and pathological conditions provoked by this critical state.

Collapse operations in case of pleural adhesions

In conclusion the writer may add a few remarks regarding the endeavours to overcome pleural adhesions in pneumothorax treatment.

During the last 10 to 15 years quite a number of methods have been published, especially by continental authors. The majority of these suggestions have not proved to be of much practical value, but two different methods have proved so valuable as to secure a permanent position in collapse therapy. As representing two different ways of solving the question, these two methods are to be used according to the quantity and character of the adhesions present in individual cases.

One of the two methods is to perform an endopleural operation by which the localised bands or string-like adhesions are removed and the pneumothorax is carried on with more complete collapse than before. A wide opening of the pleura in such cases meets with such dangerous complications as to make it inadvisable to experiment further in this direction. By Jacobæus' invention, however, a method has been found which involves much less risk when used only in cases fulfilling the conditions for this special technique.

The principle of Jacobæus' method is to cut through the adhesion, which is keeping a part of the lung expanded, by means of cauterisation, without opening the pleura by incision. Through a wide trocar, introduced under local anaesthesia in an intercostal space near the adhesion (localised by careful X-ray examination) a thoracoscope is

inserted into the pneumothorax cavity. Through the thoracoscope the whole pleural cavity can be examined. Through another smaller trocar a small platinum knife on a long piston is introduced in another part of the chest, conveniently for manipulation. Led by the thoracoscope, the knife is placed upon the adhesion and when in position the knife is made white-hot by an electric current and can now be passed through the adhesions.

This operation, by which the author has previously had successful results, was tried in one of the above cases (No. 10) in which a cavity seemed to be kept in expansion by a localised adhesion. This attempt proved a failure owing to the lack of any satisfactory electric outfit. The technique is rather complicated, but the operation is of much interest as a unique example of the surgical possibilities of modern days.

The second method, which may be used in cases where the adhesions do not allow the use of Jacobæus' method, or where it is impossible to apply any larger pneumothorax at all, is to establish the same collapse of the lung as is afforded by a successful pneumothorax by means of an extra-pleural operation, thus causing the bony chest wall to collapse, together with the lung.

The "extra-pleural thoracoplasty" (Friedrich Brauer, Sanerbruch, etc.), has been developed to such a degree of technical and clinical success that, in spite of all more or less justified criticism, this heroic method is really to be reckoned with as a last resort in many cases, which otherwise would not have any chance of successful treatment.

Sanerbruch's technique, which is to be modified according to the special needs of individual cases, leaves the lung in a condition of collapse by removal of larger or smaller parts of all the ribs (excluding the lower one or two) through a long hook-shaped incision running from the spine of the scapula, parallel to the spine down to the tenth rib, which it follows to the mid-axillary line. Through this incision the whole of the back part of the thoracic wall is laid freely open and subperiosteal resection can be made to the necessary extent, especially of the spinal ends of the ribs, by the rigidity of which the shape of the thorax is normally kept in its capacious position.

The comparatively encouraging results previously obtained by the author in 60 cases of thoracoplasty made us use this operation in one of the 28 cases in which it was impossible to apply any pneumothorax at all. This case was judged to be so advanced that there was no possible hope of obtaining a lasting result by ordinary treatment.

Pneumothorax was tried in order to check severe hæmoptysis, but the attempt showed that universal adhesions were present. Later on thoracoplasty was performed, but in this case the patient succumbed seven hours after the operation on account of heart failure. This sad complication may have been due to the fact that no

other anæsthesia could be provided than general chloroform narcosis. As this operation itself affects the heart a good deal, it is usually performed under local anæsthesia (novocain-suprarenin), or by light ether narcosis, or by a combination of these two kinds of anæsthesia (as suggested by the author, vide *Tubercle*, June 1921). The disappointing results in this case made us feel that further attempts on the same lines must be postponed until the sanatorium could afford an equipment with X-rays and a full operation outfit necessary for the adoption of such formidable surgery.

It is to be hoped that further studies may be made on these subjects in India. The average stage of those tuberculous patients who seek medical help in this country is so advanced as to make it desirable to adopt any treatment by which some of these sufferers may be relieved.

CULTURAL EXAMINATION OF THE URINE IN KALA-AZAR

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and

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OUR excuse for publishing this note is the fact that the success of Shortt (1923) in obtaining a pure culture of the herpetomonad form of *L. donovani* from the urine of a kala-azar patient has led to certain statements on the possibilities of the urine being the transmitting medium of the infection of kala-azar, which are obviously absurd and which were certainly not suggested by Shortt himself.

Both writers have been interested in the possibilities of urine being the transmitting medium of the infection of kala-azar and with this possibility in view made an effort last year to obtain cultures of the herpetomonad form of *L. donovani* from the urine of patients suffering from this disease. In conjunction with Knowles (1923) we attempted to obtain cultures from the urine of six untreated kala-azar patients without success. The findings of Shortt encouraged us to make another attempt. At first we took catheter specimens of urine, but we subsequently found that by carefully washing the meatus with perchloride of mercury followed by distilled water, a sterile specimen could be obtained with rather more certainty and with considerably less trouble to us and discomfort to the patient. The first few ounces of the flow of urine were discarded and then about 25 cc taken into a sterile test tube. This was allowed to stand for a couple of hours before a drop or two was pipetted from the bottom of the tube, including the deposit if there were any, into 3 or 4 N.N.N. tubes which were then incubated at 22°C.

Sixteen specimens of urine were taken from 16 different untreated male kala-azar patients in whom the diagnosis had been made (in every case) by the demonstration of the presence of the parasite. In no case was a culture of herpetomonad forms of *L. donovani* obtained from the urine. The results that we obtained were as follows —

All the tubes became contaminated prior to the first examination in 6 cases

At least one of the tubes remained sterile for 9 to 12 days, subsequently becoming contaminated in 4 cases

Two or more of the tubes remained sterile for a month or more in 6 cases

We then repeated this experiment with two more cases, but in each of these two cases we took two sterile test tubes of urine and to one tube added two drops of blood taken from the vein of the patient at the same time. Two drops of blood from each patient were also placed in tubes of citrate saline, so that there were three tubes from each of these two patients. The deposit from each of these three tubes was inoculated into each of three tubes of NNN medium

The following results were obtained —

	1st case	2nd case
Urine only —	Sterile no flagellate*	Contaminated
Urine plus blood —	A rich culture of flagellates	"
Blood in citrate saline —	A rich culture of flagellates	"

The examination was made after 9 days incubation

Conclusion

Our previous failure in 6 cases, our present failure in 11 cases, in which the flagellates had a reasonable chance of development, and Shortt's* negative results make it clear that as a general rule a viable form of the parasite is not present in the urine of a kala-azar patient

Under special circumstances the parasites may be present, but they are present only in the cellular deposit that has found its way into the urine on account of some pathological condition of the urinary tract. One example of such a condition can be imitated by the addition of a few drops of peripheral blood to the urine in vitro. The fact that the parasite is recoverable from the urine when this has been done shows that urine does not destroy the parasites and further that the accident of an abrasion to the mucous membrane of the bladder or other part of the urinary tract, by scratching by oxalate crystals or through some

other cause, could allow the escape of a viable form of the parasite into the urine

We do not think that this accident can possibly have any connection whatsoever with the epidemiology of the disease

The atypical type of the disease referred to by Shortt, in which the liver and spleen are not enlarged is by no means uncommon and forms from 1 to 2 per cent of the general kala-azar outpatient attendance at the Calcutta School of Tropical Medicine, but it is probable that the condition is much commoner than these figures suggest. The lay public and even the medical profession associate kala-azar with a condition of enlargement of the spleen and liver, and it is natural that when these conditions are absent kala-azar is not suspected and consequently the patients do not come for treatment for this disease

There are advanced cases of kala-azar with very large spleens, others with slightly enlarged spleens, yet others with no apparent enlargement of the spleen but enlargement of the liver and finally cases without either apparent enlargement of the spleen or liver. As these conditions of enlargement or otherwise of the spleen and liver are not associated with any other special signs and symptoms except those that are directly dependent on the enlargement of these two organs, and as all the intermediate stages of these conditions are seen, one does not seem justified in classifying them into four distinct types and certainly not in suggesting that there can be any distinction in the etiology of these types

It is of course possible that in cases where the liver and spleen are unaffected by the disease, the kidneys bear the brunt of the attack and there is consequently not only more cellular deposit in the urine but this deposit is more highly infected with leishmania

The discrepancy between our findings and those of Shortt can probably be accounted for by the fact that he centrifuged the urine, a procedure which we, working in the plains in the hot weather, find impossible in the interests of sterility, and thereby obtained a deposit rich in cellular elements. If this explanation is accepted our contention is further emphasised

Our thanks are due to Major R. Knowles, M.S., Calcutta School of Tropical Medicine, for permitting the junior writer to co-operate in this small investigation

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*We assume that he did not make an isolated experiment

THE PSYCHOPATHIC CHILD

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AMONG the many things that the twentieth century has brought to mankind, perhaps not one will stand out so clearly in years to come as the discovery that the human mind, especially the mind of the human child, is not a piece of indestructible machinery. Already in Europe and more so in the United States of America, has considerable progress been made in the study of mental functioning, both normal and abnormal. The term "asylum" is giving place to "mental hospital" and the idea of regarding mental disorders as the outcome of ascertainable factors is ousting the belief that that which once was referred to as "lunacy" was caused by a supernatural and diabolical agency. Last, but by no means least, is the logical conclusion that, as with diseases of the body, so with diseases of the mind, prevention is better than cure. Indeed, from what has been already learned, it would appear that no aspect of preventive medicine is so likely to justify financial support, either public or private as mental hygiene and prophylaxis. Besides the doctor, the teacher and the legislator, the man in the street must get it into his head that in the interests of the community the psychopathic child has got to become an object of the most accurate and scientific observation. By reason of ignorance and neglect in the past our prisons and mental hospitals have been continuously filled with the psychopathic children, either as adults or adolescents. Is this to go on for ever? There is no excuse for so doing in any community that is not wickedly stupid or wilfully blind. Our present state of knowledge shows us that there are two main methods of detecting in children the existence of abnormal functioning. One is by means that depend for their conduct on laboratories specially equipped for the purpose and with specially trained observers to run them. The other calls for far less specialisation in both equipment and training. Little else is needed than some experience in dealing with children, a certain amount of common sense and a fairly acute power of observation. Given these qualifications it is possible, by noting the following points, to gather information of the greatest practical importance in respect to a particular child or to a group of children. —

- (1) Psychopathic children are always more or less solitary. They do not get along with other children of the same mental level

(2) They are apt to prefer the company of adults to that of persons of their own age

(3) Their games have a queer monotony which make them seem peculiar even in their own family

(4) They are especially apt to have strong likes and dislikes as regards food

(5) They are often unusually destructive of toys, clothing and even of household things

(6) They are apt to have violent tempers. They may be moody

(7) They are not usually fond of other children or pets

(8) They frequently suffer from "night terrors" and bed-wetting up to the age of 14, 15 or 16

(9) They may get along fairly well in school up to the 4th or 5th standard. They are apt to be poor in spelling and geography

(10) They are children on whom the teacher cannot rely and concerning whose misbehaviour the teacher is always worried

As to the causes of these conditions, little is known. Many are cases of congenital syphilis. Hereditary influences can be traced in some. The unhappy home is undoubtedly the cause of many. An angry bully for a father and a spiteful gossip for a mother can bring frightful havoc into a child's mind. A notable woman writer points out, with truth, that, even in our century, parents may for the most part be divided into two classes, those who act as if their children existed only for their benefit, and those who act as if they existed only for their children's benefit, the results, she adds, being alike deplorable. The first group of parents tyrannise over the child, seek to destroy its individuality, exercise an arbitrary discipline too spasmodic to have any of the good effects of discipline and would model him into a copy of themselves, though really, she adds, it ought to pain them very much to see themselves exactly copied. The second group of parents may wish to model their children not after themselves but after their ideals, yet they differ chiefly from the first class by their over-indulgence, by their anxiety to pamper the child by yielding to all his caprices and artificially protecting him from the natural results of those caprices, so that instead of learning freedom he has merely acquired self-will. These parents do not tyrannise over their children but they do worse, they train their children to be tyrants. Parents should try to leave the child in peace, to live their own lives beautifully, nobly temperately, and in so living they will sufficiently teach their children how to live

Indian Medical Gazette.

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AVOIDABLE CANCER

THE medical profession is optimistic with regard to preventive medicine as a whole but when cancer is under discussion its usual attitude is one of unrelieved pessimism.

The opening words of a special article in the *British Medical Journal* of June 9th, 1923, reflect the prevailing opinion of medical men on this subject. They are—'It is unquestionable that our knowledge of the etiology of malignant disease is imperfect, so imperfect that no system of prophylaxis has as yet even reached the stage of serious discussion. On the other hand there have been a few optimists who think that we know enough to enable us to make a very important beginning in the prevention of the disease.' For example, the writer of this note so long ago as May 1905 felt himself justified in expressing the following view in the *Indian Medical Gazette*.

"Taking malignant disease as a whole Indian experience seems to show that there is a certain amount of 'inevitable cancer' which so far as we can see is inseparably associated with the general conditions of human existence but that there is also a certain amount of 'avoidable cancer' which is associated with local and avoidable habits and conditions."

Everything that has come to my knowledge since the above words were written has gone to strengthen the opinion formed nearly twenty years ago and if I were to modify my words it would be in the direction of qualifying the term "inevitable" more emphatically than I did. It is quite possible that there is little inevitable cancer and that further work on the subject may teach us how to avoid all or nearly all the forms of the disease.

It is worth while to examine the evidence which justified me using the term "avoidable" in connection with cancer. Data concerning all the cases of malignant disease which were treated for nine years at the Calcutta Medical College were collected and the incidence of carcinoma and sarcoma in the various parts of the body was analysed according to the race, sex and religion of the patients. Similar details were obtained of the occurrence of the different forms of the disease in the patients of the General Hospital of Madras for a period of ten years. These were taken from an article by Captain Niblock I.M.S., which appeared in the *Indian Medical Gazette* of May 1902. The incidence of the disease in the two Indian hospitals was compared with that at St. Thomas'

Hospital London. A few of the most important statistics are shown in the table, details of race, sex, etc., being omitted these can be found in the original article.

	I CARCINOMA		
	The Medical College Hospital, Calcutta (nine years)	The General Hospital, Madras (ten years)	St. Thomas' Hospital, London (two years)
Cheek, jaw and gum	51	445	21
Lip	13	19	21
Tongue	34	64	29
Oesophagus and stomach	5	24	49
Rectum	6	33	33
Penis	66	201	9
Skin of body	52	27	4
Total carcinoma of all parts, including the preceding	345	896	405
II SARCOMA			
Total	205	292	102
Total surgical cases admitted during the period	11,446	(*)	7,478

* 31,400 cases treated, Medical and Surgical combined

Making every allowance for possible fallacies there are certain points which stand out very clearly in these figures.

(1) Cancer of the cheek and jaw is much more common in both of the Indian hospitals than in the English. Madras showing relatively an extraordinary number of cases. In the Calcutta series only one of the victims was a Mohammedan, though one-third of all the patients treated in the Hospital were Mohammedans. Figures given by Lieutenant-Colonel D. Sutherland, I.M.S., indicate that cancer of the cheeks and jaws is not appreciably more common in Lahore than in England.

Captain Niblock suggested that the great frequency of the disease in Madras was due to the habit of mixing large quantities of lime with the chewed betel. There can be little doubt as to the association of cancer of the gums and cheeks with the habit of chewing "pan", specially as most of the growths originate at the very spot where the plug of "pan" is kept in the mouth. There is need for further investigation as to which of the ingredients is responsible, areca nut lime are the most important of these. The figures for the tongue and lip show no such differences in incidence as are seen in the case of the cheek and gums.

(2) Cancer of the penis is far more common in Calcutta and Madras than in England but the condition is not necessarily more common among people in hot countries, as there

were only two cases in the Mohammedan patients in the Calcutta hospital and the disease is quite uncommon in Europeans in India. Circumcision and cleanliness appear to be the effective means of avoiding the disease, so that it is likely that decomposing smegma is responsible for its causation.

(3) Cancer of the œsophagus and stomach is remarkably rare in Calcutta, it is rather more common in Madras, possibly because of the fondness of the Madrasis for very hot curries and betel mixed with lime, but it is far more common in the English series, and my suggestion is that hot tea and other hot articles of food and drink may be responsible for its frequency in England. An interesting statement has been made that Chinese males who eat their rice piping hot suffer a good deal from the disease, while the females who eat the cold remains of their husbands' meals are appropriately rewarded by escaping from cancer of the stomach. The figures for sarcoma, in striking contrast to those for carcinoma showed no evidence of a special incidence of the disease in certain parts of the body in any of the group. The opinion was formed that sarcoma, being a disease chiefly of the deeper parts of the body, was not influenced by variable external conditions in the same way as carcinoma. It was with special reference to sarcoma that the term "inevitable cancer" was used.

It seems probable that after the carcinoma problem has been solved, the sarcoma problem may remain.

(4) The greater frequency of cancer of the skin of the body in the Indian groups as compared with the English suggests that the scanty covering of the Indian is not sufficient to protect his skin against various harmful external influences.

Reference was also made in the note to the remarkable figures given in the *Indian Medical Gazette* of May 1902 by Dr Neve of Kashmir "Kangri burn" cancer constituted three-fourths of all the operable cancer cases seen in Dr Neve's hospital, and as the disease occurred exactly at the spot which was irritated by the heat of the "kangri" there seems to be no possible doubt as to the association between chronic irritation by heat and the development of the disease.

Taking all these forms of the disease into account and also the well-known examples of chimney-sweeper's cancer, clay pipe smoker's cancer and others it was considered that there was ample justification for the claim that some forms of cancer are avoidable, these being associated with forms of chronic irritation which can be eliminated. It would also appear to be reasonable to assume that there may be a similar factor in the form of chronic irritation in other cases in which the association is not yet evident and that research into

other possible sources of irritation would be well worth while.

For some reason, too little attention has been paid hitherto to the evidence derived from observation of cancer in human beings, perhaps there has been some reluctance in accepting chronic irritation as a cause of cancer partly because the earlier attempts to reproduce the disease in animals by irritants were unsuccessful and partly because it was felt that the association between chronic irritation and cancer might not be one of actual cause and effect. Irritation might be admitted to be associated with the disease, but it might only bring about some condition under which the real causal agent was favoured, and so we might be wrong in regarding the irritation as the real cause of cancer. Even if we have the greatest respect for an attitude of scientific caution, scepticism may be carried too far. It does not matter much whether we find out the real cause of cancer provided that we can find out how to prevent the disease.

Years before the discovery of the tubercle bacillus it was known that fresh air and good food were the enemies of tuberculosis. If this knowledge had been put to practical use, the disease might have been brought under control even before the tubercle bacillus was discovered.

Recent discoveries in connection with cancer have taken away from the sceptics their last excuse for ignoring chronic irritation as a factor of great importance in causing cancer.

Radiologists' cancer has been added to the list of cancers associated with chronic irritation and recently it has been shown that cancer can be caused in animals by repeatedly painting their skin with tar and other irritants and also by injections of tar. The credit for the first successful experiments of this kind is due to two Japanese workers, Yamagiwa and Ichikawa, who employed repeated tar applications to the ears of rabbits in their experiments.

Some of the important pieces of experimental work of recent years are (1) the findings of Dr Archibald Leitch that mice of all ages are equally susceptible to the disease, from this it would appear that the duration of the period of irritation rather than the age of the animal is the important factor. Possibly the increased incidence of cancer among elderly human beings is due chiefly to the fact that the irritant has acted for a longer period in old people than in young. (2) The finding by the same observer that after the prolonged application of the irritant the disease may progress to the fullest extent, even if the irritant has been withdrawn before the disease has made its appearance. (3) The discovery by Fibiger that cancer of the pylorus of rats can be reproduced by allowing the animals to feed on American cockroaches which are infected by

the larvæ of a nematode, the adult worm being invariably associated with the actual growth

There is now a formidable list of irritants which have been shown to be capable of producing cancer, tar, shale oil, soot, heat and X-rays are effective in the case of the skin. Some of the constituents of "pan" give rise to cancer of the cheeks and gums. A nematode worm is associated with cancer of the pylorus in the rat, a tape-worm cyst with cancer of the liver of the same animal, decomposing smegma appears to be capable of producing cancer of the penis. Other forms of irritants against which the evidence is less complete, but yet is very strong, are hot and highly spiced foods and drinks in the case of cancer of the œsophagus and stomach, sharp fragments of the teeth in the case of cancer of the mouth, gall stones in cancer of the gall bladder and bile ducts and syphilitic granulomata in the case of cancer of the tongue and larynx. If many forms of irritation have been proved to be associated with the appearance of the disease is it not justifiable to assert that the avoidance of these sources of irritation will prevent the disease? Is it not also reasonable to recommend very strongly the removal of all irritants which are under strong suspicion? Such a procedure can do no harm it is neither risky nor expensive

Is it not also reasonable to regard the discovery of the part played by chronic irritation as a strong clue which is well worth following up in the case of other forms of cancer which are still regarded as being of mysterious origin? May not bacterial or mechanical irritation associated with constipation be factors in connection with cancer of the rectum? May not irritation by decomposing organic material and medicinal irritation be important factors in causing cancer of the cervix? May not friction by clothing combined with infection of the ducts be responsible for cancer of the breast?

It would be wrong to accept any of these suggestions without the closest investigation and it is not safe to ignore other possibilities. On the other hand it does not appear to be reasonable to lay stress on the part played by chronic irritation in so many forms of the disease and then to go on to make the assertion that we are not in a position to begin to discuss the prophylaxis of the disease

We may well admit that the first cause of cancer is quite unknown, but then so are many other first causes, we do not know why certain small particles of protoplasm should be capable of developing into human beings but we do not hesitate to discuss such subjects as eugenics and embryology because of this ignorance. It is quite possible that we may acquire enough knowledge of the conditions associated with the appearance of cancer to

enable us to control the disease, and yet we may remain ignorant of the real cause

It is not suggested that we should give up the attempt to find out the actual cause of cancer. A knowledge of the cause would be of great value in helping us to control the disease, but if the prevention can be attained by following an easier path than that leading to the discovery of the ultimate cause of the disease, we should follow that path without shame and without hesitation

There is at present considerable difference of opinion as to the best lines on which to carry out research work on cancer. Animal experiment has yielded results of the greatest value, these results, it is true, chiefly confirm what has been observed in human beings years ago, but they have been of great service in convincing the sceptics as well as in adding to our knowledge and it is essential that experimental laboratory work should be pushed on with greater energy than ever

Many important data have been collected regarding the occurrence of the disease among various races of mankind, these have not yet been worked up in such a manner as to be readily available to research workers, and it is likely that many of them will be found to be of little value because the association of the special prevalence of each form of the disease among particular races has not been traced to its appropriate cause. Considering the vast sums of money which are now being spent on cancer research it is desirable that the occurrence of the disease in man should receive its fair share of attention in the future. Cancer of the penis, cheek and gums and Kangri burn cancer may be regarded as having been fairly well explained, but a fruitful field of research lies in cancer of the stomach. This is a disease of vast importance and if it can be traced definitely to certain faulty habits of eating and drinking many dreadful tragedies could be prevented. Cancer of certain other organs lends itself very readily to such a line of research. It is likely that experimental animals may not be suitable for the production of all forms of cancer, as the duration of life of many laboratory animals may not be long enough to allow of a reproduction of conditions which may operate over a period of many years in human beings. Millions of people have been subjecting themselves to experiments on the production of cancer, many of these experiments have already been in progress for years. What is needed is to make a close enquiry into the conditions under which cancer of the various organs is found to occur among certain collections of human beings. This work, in spite of its apparent simplicity requires skilled organisation, but if it were suitably planned every medical man in the world might be enlisted as an unpaid cancer research worker. A list of questions should be drawn up which could

easily be answered by each medical man who comes across a case of cancer, the questions could be so arranged that a few minutes would suffice to fill them up and the resultant information would be of the greatest value. The examination of the records of the hospitals would also give most useful evidence of the relative prevalence of the disease among people of different habits of life, and if special case sheets were prepared for taking notes of cancer cases the information obtained would be easy to analyse.

The specialists on diseases of the breast, uterus and rectum should be invited to make a special enquiry into the prevailing errors in the hygiene of these parts of the body with special reference to finding out possible sources of chronic irritation such as have been shown to be powerful factors in causing the disease in other parts of the body.

It is also necessary that the extensive knowledge which is already in our possession should be widely disseminated among the medical profession and the lay public. In spite of the assertions to the contrary we do know something of the prophylaxis of cancer. Our knowledge if put to practical effect would eliminate several kinds of the disease altogether, and our suspicions regarding the other kinds are taking sufficiently definite shape to justify us in stating clearly that there is reason to believe that chronic irritation of the tissues of the body should be scrupulously avoided.

There is no need to ask people to undertake any risky experiments, it is obviously not dangerous to avoid drinking scalding hot tea or eating irritating kinds of food, the toilet of the breast, vagina and rectum and the avoidance of harmful forms of irritation of these are matters regarding which the public should be instructed, even if we were to doubt their causal association with production of cancer. It is likely that we might learn much from the primitive tribes of mankind who have not acquired the customs of us who call ourselves civilized, but who are really semi-civilized. Many savage races are living in accordance with the environment in which selection of the fittest has been operative for countless generations. Semi-civilized mankind has adopted many new customs during the past few thousands of years and the human frame has not had time to become adapted to these, it certainly will not do so during our life time.

It is therefore necessary for us to find out in what respects we have created a vicious environment for ourselves, and our easiest guide in this matter is the observation of the experiences of human beings. The broad view with the naked eye should be taken before we rush to the microscope and the test tube. It is too often forgotten that "the proper study of mankind is man." Modern scientists do not think much of human beings as experimental

animals, perhaps they are greatly impressed by the belief that "all men are liars" and they hope for the truth from guinea-pigs and rabbits.

I have already stated I have no quarrel with experimental laboratory work, we need more of this rather than less, but it is borne in on me more and more every day that human beings are the best experimental animals when they insist on conducting experiments on themselves.

It would be a little humiliating to us if we should find out that while we have been lamenting about the extreme difficulty of the cancer problem our eyes have been resting on the plain solution of an important part of the problem, but we have refused to see it.

J. W. D. MCGAW

A Mirror of Hospital Practice.

A CASE OF DIABETIC COMA TREATED WITH INSULIN

By A. H. PROCTOR,

MAJOR, I. M. S.,

Presidency General Hospital, Calcutta

CASE No 503, female, aged 35 years, was admitted to the Presidency General Hospital on the 23rd August, 1923, suffering from diabetic coma.

Previous History—In 1919 the patient had an attack of jaundice lasting for over two months. The attack was accompanied by severe pain in the right hypochondrium, passing through to the right scapular region. In the light of after events this attack was probably a sub-acute pancreatitis. It was sufficiently severe to confine the patient to bed for over two months, and the patient states that she has never been the same since.

In June 1921 the patient developed typical symptoms of diabetes. The glycosuria was at this time more or less intermittent and controlled by dieting.

In February 1922 she proceeded home, and was under the care of several distinguished specialists, who, on a modified Allen treatment, kept her free from glycosuria. Any attempt to introduce carbohydrates, however, resulted in glycosuria. On leaving the strict regimen of the nursing homes, she invariably relapsed, and after her last relapse, in England, it was found impossible to get her urine sugar-free. She became extremely ill when fasting, and her husband was sent for from India, as she was not expected to recover.

Eventually she recovered temporarily, and as her case seemed hopeless elected to

accompany her husband back in India. She arrived in India in February 1923, and although passing a fair quantity of sugar kept moderately well till June, when she was seized with violent abdominal pains, rigors and diarrhoea, which left her very weak and debilitated. Since then she had been confined to bed.

On the 20th August she developed an attack of dengue, and declined her food.

About 2 a.m. on the 22nd dyspnoea, pain in the chest, and rapid breathing became very marked, and her medical attendant was sent for urgently. Under treatment she appeared to improve somewhat, but early on the 23rd the dyspnoea and pain in the chest became worse and was accompanied by vomiting. At 4-30 p.m. she was admitted to hospital.

Condition on admission and subsequent progress—The patient was thin and emaciated and presented all the signs and symptoms of diabetic coma. Her temperature was 98°, respiration 44, pulse thready and 156. She was deeply comatose and could not be roused. The extremities were cold, but there was little or no cyanosis. The breath had the characteristic odour, and the urine contained sugar, acetone and diacetic acid in considerable quantities.

It was not possible to get the blood-sugar estimated so it was decided to administer insulin empirically and to watch the result.

5 p.m. Ten units of insulin injected.

To guard against hypo-glycaemia an intravenous injection of 5 per cent glucose solution and continuous glucose solution per rectum was given. In addition digitalin 1/100 grain every four hours.

8-30 p.m. No improvement was noted. Indeed the patient's condition appeared to have deteriorated, the pulse having risen to 160 and the respiration to 40, while the temperature had dropped to 96.6°. At this stage the patient appeared so ill that the day sister in her evening report noted the patient as moribund.

10 p.m. Twenty units of insulin injected.

11-40 p.m. Ten units of insulin injected.

After the last injection the patient became somewhat more conscious, recognised her husband and made some effort to reply to questions. The pulse was now 140, respiration 40, and the temperature had risen to 99.4°.

12-45 a.m. Ten units of insulin injected.

1-30 a.m. The patient was now obviously improving and consciousness returning.

3-45 a.m. The improvement was maintained. Her pulse had dropped to 96 and her temperature was 99.4°. Ten units of insulin injected.

From this time onwards the patient continued to improve steadily and by 8 a.m. was fully conscious, able to take her food and felt relatively very well. Her pulse had dropped

to 88 and her respiration was 24. At the same time the patient stated she had now got rid of "that wretched difficulty of breathing." The urine still contained sugar, acetone and diacetic acid. The blood-sugar, estimated at 9 a.m., was 0.08 per cent and this in spite of the fact that glucose and sugar had been administered by rectum and by the mouth.

In all 60 units of insulin were given in twelve hours, and an apparently moribund patient changed into a cheerful invalid who did not look very seriously ill. The patient has since steadily progressed, and has put on weight. Observations are now being made to ascertain the optimum diet and dosage of insulin.

Note—At the time we had not immediately available any literature about insulin, and the urgency of the case did not permit us to delay until we had referred to it. It is therefore not suggested that the dosage here adopted is the best.

The effect of an injection of insulin lasts for a period up to eight hours, and possibly the later doses were not necessary.

Thus in the two cases reported by the Medical Research Council (*B. M. J.*, April 28th, 1923), one case received 18 units only and the second case 10 units every three hours.

Professor Maclean recommends an injection of 20 units followed by another 20 units in a short time, if the symptoms do not improve (*Lancet*, May 26th, 1923). Whatever dosage is employed it would appear advisable to administer an ample supply of carbohydrate at the same time, in order to avoid any risk of the development of hypo-glycaemia.

INTRAVENOUS IODINE IN THE TREATMENT OF SEPTIC WOUNDS

By PHANI BHUSAN MUKHERJEE, Jogiara, Darbhanga

ENCOURAGED by reports of successful cases in the *Gazette*, I had recourse to intravenous iodine medication in the treatment of septic wounds and found it very efficacious in bringing about a speedy recovery.

Case 1. My first case was a Mahomedan girl of 10, an inhabitant of a village four miles away from my dispensary, who while out buying something from the nearest shop was attacked on the way by a rabid dog in consequence of which she fell down and was badly mauled in the face with the production of the wounds noted below—

(a) A lacerated wound tearing obliquely the left half of her upper lip into three pieces, the central one being very small and difficult to unite.

(b) A vertical wound splitting the integument covering the nasal septum into two

(c) A small penetrating wound reaching the interior of the nose at its root, just below the forehead

(d) A slight laceration below the right lower eyelid near the inner angle

The girl sustained the injuries at 10 a.m. and was brought to me at about 4 p.m. Considering the gravity of the injuries inflicted with regard to the disfigurement which would result, especially in a girl of that age, and bearing in mind the prime importance of sending each and every patient to Kasauli for anti-rabic treatment, I referred the case to the Sadar Hospital, Laheria-Sarai as directed by the medical officer thereof in a circular, but the guardians of the girl refused to send her to Kasauli and I was reluctantly compelled to take her for treatment

Although several hours had elapsed after the injuries and as the wounds were lacerated and their edges ragged, I anticipated that they would become septic especially the labial wounds which were sloughing and exfoliating. Notwithstanding this I sutured the edges after preliminary thorough washing with strong carbolic lotion and free application of tincture of iodine. The wounds were then sealed with Tinct. Benzoinæ Co. covered with cotton wool and firmly bandaged.

The cutaneous injury in front of the nasal septum healed by first intention, whilst the wounds on the lip in one place and those at the root of the nose showed pus, but healing took place steadily on dressings with hydrogen peroxide, tincture of iodine and benzoin. She ran no temperature and the recovery was uneventful. I am glad that the disfigurement of the lip is so very slight, the scar which was left being unavoidable under the circumstances. $\frac{1}{2}$ cc of B.P. Tinct. Iodine was administered intravenously, undiluted, daily for the first four days, and then on every fourth day up to the second week, subsequently twice a week for the remaining six weeks during which the patient was kept under observation for the appearance of hydrophobia, the signs and symptoms of which fortunately never appeared.

Case 2 The second case was an adult Mahomedan of the same village injured by his own horse, which had been bitten by the dog referred to in the previous case and which also went mad. It bit its master, inflicting a severe lesion on the ball of the left thumb.

The patient came to me on the following morning for treatment. As the wound was septic, I cauterised it with pure carbolic acid and later dressed it daily with iodine and borodoform. The patient was put on to intravenous iodine treatment on the same lines as given in Case 1, and made a splendid recovery in about a week.

It was in the latter part of November, 1922 that the first case was brought to the

dispensary, whilst the second came to me in the middle of December of the same year for treatment. A full six months have elapsed since then and both patients are progressing favourably and have shown no evidence of hydrophobia.

My object in publishing the cases is to bring to the notice of readers the efficacy of intravenous iodine in the treatment of septic wounds.

A CASE OF PROGRESSIVE MUSCULAR DYSTROPHY

By J. W. MCK NICHOLL, M.B., B.Ch. (Cantab),

M.R.C.S., L.R.C.P.,

Mission Hospital, Quetta

THIS case is of interest for two reasons, in the first place the rarity of the condition, and secondly the points raised in diagnosis.

The patient being a Brahui of the agricultural class, it was not easy to elicit the history, as he only spoke Brahui, which had to be translated by a third person, but I append as clear a statement of the facts as was obtainable under the circumstances.

The special points shown in the photographs are—

(1) The method of attaining the erect position, simulating the climbing method of the Aran Duchenne type.

(2) No wasting of the muscles of the hands. Hypertrophy of the biceps in places.

(3) The talipes position of the feet, (claw-foot).

(4) The position of the back (Myopathic lordosis).

G.M., age 23. Unmarried. Kalat State.

Family History—Father alive, healthy. Mother died after one month's illness. Four brothers died before the patient's birth, one aged one year, one two months, another six months, and the last two years. The cause of death is not known in any case.

Past History—No history of acquired syphilis. Small-pox seven years ago. Two years ago he had "fever" for twenty days which was followed by the present trouble.

Past History of present illness—After this attack of "fever" he gradually felt weaker and weaker. The muscular wasting was preceded by loss of power, the hypertrophy probably hiding the actual degeneration. The weakness first appeared in the muscles of the back, followed by weakness in the thighs, legs and arms simultaneously.

There was pain at the onset in the thighs, leg, back, and right arm muscles. This was more acute during the night and lasted for about six days. Since then he has had no pain.

State on admission to Hospital—General appearance—No signs of congenital syphilis. Facial appearance thin. Somewhat nervous.

The gait immediately attracted attention. The patient walked on his toes, his whole body swayed, the abdomen protruded and the shoulders were thrown back (owing to the lordosis)



Cardio-vascular System—Pulse, arteries were not hard or tortuous, rhythm was regular, not rapid except after slight muscular exertion. Heart, apex beat in the 5th intercostal space internal to the nipple line. At the apex there was a soft faint systolic bruit,

diastole was clear at the apex and base. Lungs, nothing abnormal on palpation, percussion, or auscultation.

Alimentary System—All food taken and digested easily.

Muscular System—Back, atrophy of the erector spinæ, and trapezius and latissimus dorsi. Arms, hands not wasted at all, hand grip good, slight wasting of fore-arms. Extreme wasting of the upper arms, slight hypertrophy of the remains of the left biceps. Legs, thighs much wasted, the feet remain in a position of extreme talipes equinus. Unable to protrude the tongue, contractions occurring and driving it from side to side. No facial paralysis. Abdominal muscles are apparently normal.



Nervous System—No nystagmus. Pupils react to light. Knee jerks absent, ankle clonus present, Babinski's sign elicited only occasionally owing to the hardness of the skin of the sole of the foot.

Sensory—No loss of sensation in any part of the body.

Diagnosis—In discussing the differential diagnosis, the first question that arises is whether this is one of the atrophies or a dystrophy. In muscular atrophy the hands are generally first affected and there is no sign of any hypertrophy. In this case there remain signs of a quondam hypertrophy and the hands are unaffected, also there are no sensory changes. Peripheral neuritis is excluded by the absence of pain. A preceding acute anterior poliomyelitis, from which recovery has taken place, is excluded by the age of the

patient, and the distribution of the atrophy, which is symmetrical in this case and is rarely if ever so in acute anterior poliomyelitis.

The treatment adopted was a course of strychnine injections. These failed to improve the condition in any way. Tonics, such as iron, arsenic, and nux vomica also proved useless. Massage was not of any use.

The prognosis unfortunately is bad, this being a mortal disease.

A PUNCTURED WOUND OF THE ABDOMEN

By RAO SAHIB R S TEMBE, I M & S B M S, Kalyan

A boy of six years of age, belonging to the hill tribes was brought to the dispensary for a punctured wound of the abdomen as the result of an accidental fall on to the pointed stump of a tree. It was situated horizontally just below the umbilicus, and the skin wound measured $2\frac{1}{2}$ in by $1\frac{1}{2}$ in. The actual puncture in the abdominal cavity was somewhat circular and about 1 in in diameter. Through this opening about 18 inches of the small intestines with mesentery and also a portion of the great omentum had protruded. The accident took place at 4 p.m. and the boy was brought to me at 10 p.m. The viscera were wrapped in dirty rags and were tied on the abdomen. His temperature was 102° , pulse weak, eyes sunken and the boy looked very anxious. The viscera were well washed with warm saline and wrapped in a sterilised towel. The abdominal wall was thoroughly cleansed and the intestines were gently re-introduced in the abdomen. The protruded portion of the great omentum was transfixed and tied in two halves and cut off. The stump was replaced in the abdomen and the wound was sutured in the usual way. The boy made an uneventful recovery and was discharged cured on the 15th day.

A CASE FOR DIAGNOSIS

By SHIYAAT ULLAH I M P

Police Hospital Meerut

UNDER instructions from Major C H Reinhold Civil Surgeon Meerut, I beg to submit particulars of the following case which is of interest—

Police Constable Balaram Singh was admitted on the 3rd April 1923 to Meerut Police Hospital for petechial hæmorrhages over the whole body. He was debilitated and anæmic. The hæmorrhages varied in size from that of a pin's head to that of a pea and had appeared only 4 days previously. He had suffered from intermittent fever for a fortnight before these eruptions appeared.

On admission the temperature was normal, pulse 78 weak and compressible. The spleen was hard and enlarged to five finger breadths

below the costal margin. The liver was enlarged to three finger breadths below the costal margin. He was put on to calcium chloride at once but on the 4th April, 1923, at 5 a.m., epistaxis started vigorously and continued slowly throughout the day. In the evening the temperature was 99.4°F . The bleeding did not stop until the evening of the 5th. On the morning of the 6th he complained of nausea and shortness of breath, there was some flatulence, the temperature was normal, the pulse quick and feeble, with gasping breathing at times and some restlessness,—all of which indicated internal hæmorrhage in the abdomen. He sank gradually and died at 3 p.m. Major C H Reinhold the Civil Surgeon carried out a post-mortem examination at 5 p.m. and found the following conditions present—

General Condition—Anæmic and fairly well nourished. Rigor mortis present in the whole body. Heart transposed to the right side of the chest and pale. The pericardium contained clear fluid. Petechial hæmorrhages over the whole surface of the heart which was 8 ozs in weight.

Lungs—Right, 20 ozs. It had two lobes only, the upper anæmic and a large blood infarction in the lower lobe. Left, 18 ozs, also two lobes old dense adhesions small hæmorrhages between the lobes and blood infarction in the lower lobe at the base.

Peritoneum—Petechial hæmorrhages in the parietal layer and some blood-stained fluid in the lower part.

Stomach also transposed, duodenum to its left, and contained undigested milk and water. A glandular hæmorrhagic mass resembling pancreatic tissue lay near the œsophageal end on the lower curvature of stomach. *Pancreas*, head to the left and tail to the right, appeared normal. Petechial hæmorrhages into the small intestines, appendix normal, mesenteric glands enlarged and a few of them hæmorrhagic.

Liver—71 ozs, very pale and enlarged. Gall bladder full. Transposed to the left side.

Spleen—46 ozs, enormously enlarged and lobulated and transposed to the right side.

Kidneys—Right 4 ozs. Three small accessory spleens present below it, left $3\frac{1}{2}$ ozs. Both anæmic at the cortex and congested at the pelvis. Small cystic degeneration on the surface of both.

Death was apparently due to purpura hæmorrhagica.

Portions of the viscera were sent to the King George V Medical College, Lucknow and the pathological report was as follows—

The liver shows aggregation of leucocytes at different foci, some of them showing signs of going on towards suppuration. The pancreas shows nothing abnormal except slight thickening of the blood vessels. The spleen

shows intense leucocytic infiltration. The kidney shows a certain amount of cloudy swelling.

Current Topics.

The Mass Diagnosis of Ankylostome Infestation

The general laboratory worker and especially those working upon ankylostome infestation would do well to read carefully an admirable paper on this subject by Lieut-Colonel Clayton Lane, M.D. (Retd.), in the *Transactions of the Royal Society of Tropical Medicine and Hygiene* for November-December 1922, Vol XVI Nos 5 and 6, pp 274 to 313. The author herein reviews all the different methods of concentrating ova for examination, the principles involved, the counts obtained, and the advantages and disadvantages of each. Finally he describes in full detail his method by direct centrifugal flotation and the apparatus employed, the most essential point of which is that the cover slip upon which the ova rest, and which is finally examined is used to cap the centrifuge tube itself so that there is no loss by transference. The paper is too long for adequate review but as the result of Colonel Clayton Lane's many years of study of the problem, and in view of its rapidity and extraordinarily successful results, the article is one which should be studied in the original.

The Treatment of Trachoma

DR. HEMENDAS R. WADHWANI M.D. B.S. writes from Jacobabad Sind to comment upon the frequency of trachoma in that district especially in the Kandhkot and Kashmon talukas. As touring medical officer of the district he has seen some 3000 cases of granular lids within a year, most of them being school children and has accordingly tried several different lines of treatment. Finally he has come to rely upon the following method—

After anaesthesia, for which general anaesthesia is to be preferred to local the eye is washed with boracic lotion. The lids are then everted and expressed with Knapp's roller forceps in the usual manner, by pushing one limb of the forceps into the fornix, the other upon the palpebral conjunctiva and then rolling, after pressing them together with some force. The bleeding surface is then again washed with boracic lotion. Copper sulphate stick is now rubbed hard into the conjunctiva of the lids until the conjunctiva takes on the colour of the stick. The most scrupulous care must be taken to avoid touching the cornea. Any copper sulphate dissolved in the tears should be swabbed away and the whole is then followed up by a thorough washing of the eye with boracic lotion. A drop of 5 per cent to 8 per cent argyrol is next instilled into the eye which is then dressed and bandaged. For three or four days the dressings are removed night and morning the eye washed out with boracic lotion and argyrol instilled. For a week or ten days more simple washing with boracic lotion is continued.

If necessary the operation may be repeated a second third and even fourth time if required. Even the most intractable type of case, however, will yield in less than two months. Cases which have been seen again in two years subsequently have shown no recurrence.

Where the attack is acute the treatment must be delayed for a few days until the eye is ready for strong measures. Corneal ulcer is an absolute contra-indication to copper sulphate treatment, and the ulcer must have completely healed before it can be instituted. Cases of ectropion are especially suitable, although, if advanced, they may require further operative measures. Opacities of the cornea due to trachoma, will require subsequent treatment for some time with yellow oxide ointment.

A case is quoted of a male patient, aged 35, who had suffered from severe granular lids with ectropion since

childhood, cured after three such treatments spread over a period of seven weeks, and seen again six months later. The corneal opacities which had been present at the time of admission had cleared under yellow oxide ointment, and there was not a trace of granulation of the lids—(Abstract from original communication)

Incidence of Hookworm Disease among persons who were cured five years ago.

By DWIGHT L. SISCO, M.D., New York.

Jour A M A, Feb 17, 1923, p 451

THIS paper reports certain results obtained during a re-survey of an area on the island of Antigua, British West Indies, in which measures for the relief and control of hookworm disease were terminated five years ago. The paper demonstrates certain fallacies in campaign procedure and emphasizes the need for definite measures in order that permanent hookworm control may be attained.

During the treatment campaign of 1915-1917, 7,477 persons were examined in the area which was later re-surveyed. Of these, 2,229, or 29.8 per cent, were found infected with hookworm disease. Of the infected persons, 1,972 were cured, so far as this could be determined by the microscope. The anthelmintic used was thymol, exclusively, the maximum dose given was 40 grains (2.6 gms).

At the completion of the control campaign, all treatment ceased, as no organization was left to carry on the work.

When the treatment campaign was practically finished, the authorities of Antigua built pit latrines throughout the re-surveyed area and appointed part-time sanitary inspectors to see that these were properly maintained. No latrines have been constructed since February 1920, and no organized hookworm-control measures have been in force since June 1917.

RE-SURVEY FINDINGS

In April 1922, a sanitary study of the re-surveyed area was made. Rural sanitation and hygiene were of a very primitive type. One hundred and forty-one latrines all badly in need of repair, were found, this was one latrine for every fifty people.

The infection rate in 1922 was 21.2 per cent. of those who had previously been "cured."

In 1915-1917 the only drug used in treatment was thymol. The number of treatments necessary before a cure was effected varied from one to seventeen.

In general, as the number of treatments received in 1915-1917 increases, the rate of re-infection in 1922 increases especially up to the eighth treatment. Darling and Smilie have shown that the microscope is not a reliable index of cure, and that in persons harbouring from five to twenty hookworms the ova may not be discovered in the stools. It is highly probable that many of these apparent re-infections especially after the fifth or sixth treatment in 1915-1917, were continued infections.

The observations emphasize the requirements for permanent results in hookworm control. It is argued that no treatment work should be started in an area which has not been previously made sanitary.

For permanent control the requirements are as follows—

Latrines should be built not only at the homes of the labourers but also in the fields where they work, for it is in the latter places that most of the infection occurs. The skin of the feet and legs should be protected from contact with infested earth by shoes or other covering. Intensive treatment work should not be discontinued until an organization competent to continue control operations is functioning. The construction of latrines is only the beginning of sanitation. Public health education is the power that keeps in motion the machinery of sanitation. An organization competent to maintain unrelaxed public health education, sanitation and treatment is essential to the maintenance of the results of hookworm-disease prophylaxis.

The Treatment of Duodenal Ulcer

In an address delivered to the Harveian Society and published in the *Guy's Hospital Gazette* for the 14th April 1923, Dr Arthur F Hurst draws attention to the unfortunate results which only too often follow the surgical treatment of this condition, and raises the question as to whether many—if not the majority of cases—might not shew better results on purely medicinal treatment. In 5 or possibly 10 per cent of gastro-jejunostomies performed for duodenal ulcer jejunal or gastro-jejunal ulcer follows, and of 50 such consecutive cases seen 14 had a jejunal ulcer following operation. Further the mortality of the operation is some 5 per cent. Fatal hæmorrhage from a duodenal ulcer is not as frequent as is supposed the Guy's Hospital records from 1910 to 1917 indeed only record one case, and that occurred shortly after a gastro-jejunostomy. Indeed perforation and fatal hæmorrhage are apt rather to occur in the concealed case with slight and overlooked symptoms than in the developed case under proper diet and care. Dr Hurst claims that every case of duodenal ulcer will heal with efficient medical treatment. His principles of treatment are to give a diet which is mechanically and chemically non-irritant olive oil is freely used and alkalies given in large doses. As the exciting cause of the ulcer is in every case some focal septic lesion teeth tonsils, nares and nasal sinuses should be examined. The following is his outline treatment for an acute case in hospital and the instructions given to convalescent patients in order to avoid recurrences—

1 Milk 7 ozs every other hour from 8 a.m. to 8 p.m. inclusive. This can sometimes be replaced twice in the day by the same quantity of junket and once by custard.

To each milk feed add Mixture 1

2 Arrowroot, cream of wheat or Benger, 6 ozs, with cream, 1 oz, every other hour from 9 a.m. to 9 p.m. inclusive. Two feeds to have red-currant jelly added and two to be replaced by potato or artichoke puree.

N.B.—All the above (1 and 2) can be cold or warm, according to taste.

3 Immediately before milk feeds, $\frac{1}{2}$ oz of olive oil

4 Immediately before the arrowroot, cream of wheat and Benger feeds, 1 drachm of Mixture 2

5 Powder 2, to be washed down in 5 ozs of water at 7 a.m., and patient to lie on his right side for 1 hour

6 Powder 1, half an hour after every feed from 8-30 a.m. to 9-30 p.m. and also at 10 p.m.

7 10 p.m. Inject subcutaneously from $\frac{1}{10}$ to $\frac{1}{5}$ grain of atropine, or give dr 2 of Mixture 2

8 An enema on alternate mornings if the bowels are not naturally opened

9 Wash the mouth out after each feed and thoroughly clean the tongue by scraping with a spatula morning and evening

NOTE—During the night the patient should have a feed and Powder 1 by his bedside, so that whenever he wakes, whether in pain or not, he can take a feed followed immediately by a powder. This can be repeated as often as he is awake throughout the night

Powder 1—Prepared Chalk, gr λ

Bismuth Oxy carb, gr $\lambda\lambda\lambda$

Powder 2—Bismuth Oxy carb, oz $\frac{1}{2}$

Mixture 1—Sod Citrat, gr $\lambda\lambda$

Emuls Magnesiæ, ad i—iv drachms, the dose to vary according to the state of the bowels

Mixture 2—Tinct. Bellad, m ν — λ

Aq ad dr i

Any tablets which are taken should be crushed, and no cachets should be used

INSTRUCTIONS HOW TO PREVENT THE RECURRENCE OF SYMPTOMS

Avoid alcohol, except if desired later on, a small quantity of light wine or diluted whiskey at meals, avoid effervescing drinks

Avoid all pips or skins of fruit (whether raw, cooked or in jam, and currants, raisins and lemon peel in cake), nuts and all unripe fruit. For example, an orange may

be sucked, but not eaten. Currants, raisins and figs are particularly undesirable

Avoid all raw vegetables, whether taken alone (celery, watercress) or in pickles or salad, green vegetables must be passed through a sieve and mixed with butter in the form of a puree. Porridge is only allowed if made with the finest oatmeal

Avoid vinegar, lemon juice, sour fruit, pepper, mustard, curry, chutney, excess of salt, new bread, tough meat, salted fish or meat, pork, made-up dishes, high game, clear or thick meat soup

Take plenty of butter and cream, and a tablespoonful of olive oil before each meal

Eat slowly and chew very thoroughly

Don't smoke excessively. No smoking at all if any indigestion present

Have some food in the middle of the morning, and on going to bed, and if you wake during the night (For duodenal, but not gastric, ulcer)

Have your teeth attended to by your dentist regularly every six months

Take no drugs in tablet form

If you have the slightest return of symptoms, go to bed for a few days on a milk diet, and do not wait for the symptoms to get serious

Notes from Various Sources

Fulmerin in Syphilis—Fulmerin, a mercurial salt of low toxicity suitable for intravenous injection has been prepared by E. C. White in the Brady Urological Institute. Experiments recorded by Hill and Young in the *Journal of the American Medical Association* suggest that this is more potent than any hitherto employed salt of mercury in the treatment of syphilis. The salt is employed intravenously in conjunction with the usual arsenicals

Acetylene Gas as an Anæsthetic—Acetylene gas mixed with oxygen and scented with pine oil has been used by Gauss of Freiburg as a general anæsthetic in more than five hundred major operations without serious mishap, post anæsthetic vomiting is said to be absent

The Medical Curriculum—The Belgian Academy of Medicine recommends that at least three and a half years of the medical curriculum should be devoted to practical medical studies and recommends a considerable curtailment in the time spent in the study of biology, etc

The Influenza Virus—Ohtsky and Gates find that nearly all convalescents from influenza show agglutinins against the *Bacterium pneumosintes*, while controls never do

"Local Wassermann Test"—Stern and Rypins of Minneapolis using the Klander and Kolmer "local Wassermann test" find that by using serum taken from the primary chancre by local abrasion 100 per cent of positive reactions are obtained and in some cases this reaction is positive even when spirochetes could not be detected by dark field examination

Intra-cardiac Injections of Epinephrin—Bodon advocates the intracardiac injection of one c.c. of epinephrin solution in cases of heart failure when other measures fail. He uses a needle 8 cms long and inserts it in the 4th left interspace close to the sternum

Duodenal Ulcer, End Results of Operation—Moynihan reports that 90 per cent of the cases operated on by him for duodenal ulcer are in excellent health and the remainder are much improved. He points out that excessive smoking may bring on attacks simulating the hunger pain of duodenal ulcer

Prophylaxis of Measles—Mery and others in Paris report good results in the prophylaxis of measles by the use of two to six c.c.s of serum from convalescents. The serum is taken about the 15th day and is effective before the sixth day of incubation of the disease, given later it diminishes the severity of the attack

New Test for Tuberculosis—Wassermann professes to have worked out a serum test by which active cases of tuberculosis can be distinguished from latent cases of the disease

Tuberculin Inunction Treatment—Tuberculin is used by inunction by Philip and many advantages are claimed for it. The skin reaction does not cause great discomfort and has the advantage of giving an indication of the susceptibility of the patient. (*B M J*, March 24, 1923)

Thoracoplasty in Pulmonary Tuberculosis—Riviere and Romanis advocate thoracoplasty in the treatment of many cases of pulmonary tuberculosis (*Lancet*, March 17th, 1923)

Origin of Breath Sounds—Bushnell of Bedford, Mass points out that Beau of Paris in 1834 showed that the breath sounds originated in the upper part of the throat and that by voluntary dilatation of the upper air passages respiration becomes absolutely silent

Sulpharsenamin in Syphilis—Sulpharsenamin has the same action as neosalvarsan, but it has the advantage of being more suitable for subcutaneous injection and of being more stable when dissolved

Sex Determination—Dr Alich of Paris believes that the sex of the child is determined by the relative energy of the ovum or spermatozoon. When the male parent at the time of coitus is strong and fresh and the female weak or exhausted the offspring is more likely to be a male and vice versa

The Prophet Mohammed and Medical Research—The Prophet Mohammed is quoted as saying that "The study of the science of the human body should be preferred to the study of the religious science."

Medical Relief in Rural Areas—It is not only in India that there is a difficulty in securing medical relief for rural areas. Both in the United States and in England there is an increasing reluctance on the part of doctors to settle in the country and the objections to country practice appear to be much the same as in India. Everywhere it is a question of earning a living wage and of securing the advantages of a good education for the families of the practitioners

Antityphoid Vaccination—It is an interesting fact that the proportion of cases of typhoid fever among males and females in Paris is now two men to six women, whereas before the war it was seven men to six women. This is most convincing evidence of the value of antityphoid vaccination, which is now compulsory in the French army, the result being that the bulk of the adult male population of France has been recently vaccinated against typhoid

Yeasts as causes of Skin Diseases—Petge of Paris calls attention to the probability of many cases of eczema and intertrigo being caused by yeasts. Lesions showing sharp margins, polished appearance, fatty or creamy coating and early desquamation should be suspected of being caused by yeasts especially when they occur in diabetics

Alcohol Injections in Grave's Disease—Pajzo has used deep injections into the thyroid of 1 to 2 ccs of alcohol (80 per cent) at first every other day and then daily until the desired effect is produced. Up to 80 injections may be needed

Diet and Dentistry—Dr Brown and Dr Depree insist strongly on a diet containing whole meal bread, green vegetables and plenty of fresh unboiled milk for the nursing mother as well as the child if a race is to have good teeth and good health

Movement to expose Danger in Appendicitis—Hill Aiken of Edinburgh describes with approval the production of fever and definite symptoms in a case of appendicitis by ordering a saline aperient. If he had seen cases in which general peritonitis were caused by purgatives he would probably prefer to leave the diagnosis in doubt or to do a safer explanatory operation.

Nasal Insufflation of Tuberculin—Dr Owen F Paget employs powdered bacillary emulsion tablets of tuberculin in doses of 1/6,000 mgm. to 1/40 mgm. by insufflation into the upper nasal passages by a Politzer bag and curved glass tube.

Quinine by Rectal Injection—Dr Fletcher of the Kuala Lumpur Institute for Medical Research, having seen a number of disasters from intra-

muscular injections of quinine, determined to try rectal injections as recommended by various authors. Solutions of the bihydrochloride containing from 7 to 15 grains to the ounce caused great pain with the passage of blood and mucus. Solutions containing as little as 2 grains with starch and opium were also found very irritating and there was no evidence of absorption of the quinine. Fletcher concludes that quinine by the rectum is painful and useless (*Journal of Tropical Medicine and Hygiene*)

Quinine Prophylaxis—Surgeon Commander Leslie Morris found that 15 grains of the sulphate of quinine in acid solution given twice a day every five days was effective, provided that efficient supervision was possible. He does not recommend quinine prophylaxis if mosquito prophylaxis is practicable.

Report on Treatment of Varices by means of Intra-Varicose Injection of Quinine, published by the Medical Commission of Bouches-du-Rhone, on February 2nd, 1923, in

"La Presse Medical" No 22 of March 17th, 1923, page, 262

M L MATHIEU reports results of the treatment of six patients with injections of Quinine Bihydrochlor, regarding which Genevrier has already written enthusiastically. All six patients were cases of long standing varicose veins with ulcers and varicose eczema.

Without exception the patients were cured by two or three intra-varicose injections. Frequently the Trendelenberg sign became negative.

It was found in many cases that the cicatrization of the ulcers proceeded rapidly, in most cases treatment was administered without interference with the usual occupation of the patient, and in no instance was there any formation of scar or pain at the site of injection.

On rare occasions only, a slight feeling of numbness of the limb was experienced.

Lead Salts in the Treatment of Experimental Rat Tumours

BORREL, DE COULON and BOEZ in the *Comptes Rendus de la Société de Biologie* for November 25th, 1922, have a most interesting article on the treatment of experimental rat sarcoma by lead and other salts introduced into the tumours by ionization. The sarcoma which was employed gave a cent per cent success rate when transplanted and spontaneous cure never occurred. Fifteen days after implantation of the tumour when it had already shown considerable development, the selected salt was applied in solution on a compress of cotton wool which was placed under the positive electrode. Six Léclanché cells were arranged in series, a resistance box and an amperemeter were introduced into the circuit and a current of three milliamperes passed for about half an hour, giving four coulombs of current. From two to five applications of the salt were made at intervals of two or three days.

Nitrate of lead gave remarkably good results, the introduction of 16 to 46 milligrammes of lead caused total disappearance of the tumour in eight out of ten cases. The authors regret that it has not been possible to test the treatment on spontaneous tumours, as cases of these have not been obtainable. Spontaneous tumours of mice are more frequent but these animals are so small that the application of salts by ionization is impracticable.

Pierre Girard, writing in the same journal of the 24th February 1923, has an interesting note in confirmation of the above.

Girard has been working on rat cancer for the past two years, he has succeeded in causing solutions of various salts to penetrate experimental tumours by electrical endosmosis. He employed from choice a spindle-celled sarcoma which kills experimental rats in 50 to 60 days,

this sarcoma is extremely malignant and resists x-rays and radium treatment

In the case of three rats whose tumours had reached the size of a cherry in three weeks he applied a solution of $\text{Pb}(\text{NO}_3)_2$ by a process of electrosmosis at a single sitting in the course of which five milligrammes of lead penetrated the tumour. From the second day hyperplasia of the growth appeared and lasted for eight days, then a stage of retrogression set in during which the tumour diminished in size, hardened and finally disappeared. No recurrence took place.

The results are similar to those obtained by Borrel and his colleagues, who used lead introduced into the tissues by ionization. Evidently there are great possibilities in the use of lead salts for the treatment of cancer. Further results will be awaited with great interest, especially if tests of the method on human beings are carried out.

High Blood-Pressure and its Treatment.

In the *Glasgow Medical Journal* for April 1923, p. 209, Dr John Henderson, visiting physician to the Glasgow Royal Infirmary gives an interesting clinical lecture on high blood-pressure. Normal blood-pressure depends on four factors, (a) cardiac energy, (b) peripheral resistance, (c) the elasticity of the arterial wall, and (d) the amount of blood in the circulation. It is difficult to lay down hard and fast rules for normal blood-pressures. Roughly the most satisfactory method of estimating the systolic pressure in health is to add 100 to half the age of the individual, e.g. the normal for a healthy man of 50 should be 125 mms, for a woman about 10 mms lower. With regard to tobacco the immediate effect of smoking is to raise the systolic pressure from 5 to 25 mm, but in healthy men who are confirmed smokers the pressure is usually low although with advancing age the tolerance becomes less. Of methods for estimating pressure the oscillation method gives dependable results in experienced hands, but the auscultatory one is better.

As emphasised by Sir Clifford Allbutt arterio-sclerosis and high blood-pressure are not necessarily cause and effect, although they often go together. High pressure cases can be classified into two main groups, (a) those in which some form of nephritis has preceded its advent, and (b) those in which there is no evidence of renal disease, either preceding or at its onset. The latter is essential or primary hyperpiesia.

Clinically hæmorrhage may be the first symptom of the condition, and an example is quoted of an old gentleman with a persistently high pressure of 200 mms, who has occasional attacks of epistaxis or of rectal hæmorrhage,—attacks which act as a safety valve to the condition. Headache and giddiness with advancing age are well known symptoms, and the practitioner should always remember that ophthalmoscopic examination of the fundus oculi may often first reveal the condition. An interesting case quoted is that of a tiny little girl of 10 admitted to hospital for hæmaturia: the primary condition was chronic interstitial nephritis, the systolic pressure was 250 mms, and the patient died in uræmic convulsions. In some ways there is often established a compensation which it is unwise to disturb too severely: thus a man of 46 admitted to hospital with headache, giddiness and a systolic pressure of 180 mms became comfortable when the pressure was reduced to 160 mms, but on reduction to any lower level nausea and sickness invariably set in.

Prognosis in high blood-pressure is an extremely difficult matter, and the problem is of special importance in connection with life insurance. With a high diastolic pressure and a lowered pulse pressure the outlook is serious. In chronic interstitial nephritis a steadily rising systolic pressure despite treatment is alarming, whilst a sudden fall may indicate cardiac failure. In chronic nephritis a sudden rise of pressure may precede a uræmic crisis, and in angina pectoris with severe attacks, great pallor and a low pressure the prognosis is grave.

Treatment depends upon the cause. The intake of food, and especially of fluids should be restricted. Meats should be almost if not quite eliminated from the diet. A salt-free diet may often accomplish wonderful results. The development of some quiet hobby is the best distraction from the mental worries which so often contribute to the disease. Purgation, hot packs and baths, and in severe crises venesection are indicated. To rush immediately to vaso-dilators is a mistaken policy: they should be reserved for later use. Sodium nitrite is the drug with most constant and permanent results, the official dose of 2 grains is inadequate, and 3 to 5 grains should be given several times a day. It may well be combined with a diuretic or diaphoretic. Erythrol tetranitrate and mannitol nitrate, dose $\frac{1}{2}$ to 1 gram of each, have also been recommended. The use of high frequency currents the author has found disappointing. It is important to remember that digitalis, so far from being contra-indicated, is often useful in cases where cardiac failure threatens. Propylaxis is better than attempts at treatment, and although the "blood-pressure craze" is to be deplored,—yet people on the shady side of 40 would do well to have their blood-pressure tested as frequently as they visit the dentist.

On Limitation of effort in Heart Disease

By CLAUDE WILSON, M.D., Edm.

Brit Med Jour, June 9th, 1923, page 962

In connexion with the enlargement of the heart it is easy to make mistakes as to size, the condition may be temporary, and many permanently and considerably enlarged hearts may be safely allowed such effort as is comfortably tolerated.

Dr Wilson cites one remarkable case. Three different R.A.M.C. boards, each confirming the previous decision, threw this officer out of the army in 1919 on account of "cardiac debility with great enlargement," and he was told that he must, for the rest of his days, lead a very quiet life. As he had been used in earlier years to climb mountains and wanted to do so again he came to Dr Wilson in 1920. He was in poor condition generally, this was the result of illness and war conditions, and he had a systolic murmur, but no evidence of cardiac enlargement and a skiagram by Dr R. Knox showed a heart of normal size. Clearly the army boards were mistaken, or else the enlargement was temporary. He did some mild climbing in 1920 and it improved his condition wonderfully. In 1921 he made some fine ascents and came back very fit indeed. In 1922 he was a distinguished member of the Everest Expedition, was never sick nor sorry for a day, and now looks ten years younger than he did in 1920.

In approaching any individual case the first point to settle is whether it is or is not a cardiac case at all, or whether it is a mixed case. Dyspnoea on exertion at once suggests the heart, but many other conditions may be causal or contributory, and, though cardiac weakness may be present it may be secondary. Chlorosis, pernicious anaemia, and the secondary anaemias of malignant and other serious diseases are not only direct causes of dyspnoea but also of cardiac weakness, from lack of healthy blood supply to the coronaries.

The cases in which no restrictions at all need be imposed, beyond the avoidance of what causes obvious distress, are found in the lesser degrees of all kinds of heart lesions, and in patients of all ages, they include a large proportion of the "nervous hearts," the palpitations due to extra-systoles, and, many of the minor anginas. But the commonest case in which we can do the greatest service to the patient occurs where the irregularity of childhood and youth, due to sinus arrhythmia, has caused alarm to parent and doctor.

It is by far the commonest irregularity of childhood and youth, and the subjects though they may be prone to syncope, do not faint when they are playing foot-

ball, but do so on being vaccinated or having a thorn extracted, or on hypodermic medication, or on seeing someone else subjected to some similar procedure, or sometimes from close atmosphere, or from obviously emotional causes. The condition is due to vagal influence, and affects both auricles and ventricles. Exercise sufficient to quicken the heart's action abolishes the irregularity, and is a useful test.

The cases which, on account of the severity of the symptoms must obviously, for a time at all events be confined to bed are the bad anginas, the heart block cases with a ventricular beat below thirty, some of the tachycardias, some of the fatty hearts, the infective affections of endocardium and valves, and severe phases of the valvular lesions. But the main element in them all is the lowered efficiency—and very generally the definite disease—of the myocardium. Many of them have dropsy of the legs and albuminuria, enlarged liver, and pulmonary oedema and many have a fast and irregular pulse.

Practically all the severe cases of heart disease which show a rapid irregular pulse are instances of auricular fibrillation and, whatever the cause—whatever the valve lesion, if any—the importance both as to prognosis and treatment depends on the fact that this rhythm occurs only with a damaged myocardium, which will never again be a sound one, and yet which is perhaps more than any other serious heart anomaly, susceptible of improvement under treatment.

The irregularity of fibrillation is generally easily recognized by what is called its 'absolute' character, which means that no two consecutive beats are of equal length and volume—a point best demonstrated by instrumental tracings, but generally recognizable by the finger and the stethoscope. The irregularity is increased by exertion, and it is the only irregularity which is so increased. The rhythm, always sudden in onset is sometimes temporary, but if so it tends to recur while far more frequently when once started it is permanent.

Auricular fibrillation can often be stopped and the normal systole restored by quinine—a remedy derived from cinchona. But the effect is only temporary, and we do not yet know if it can be safely continued indefinitely, while we do know of definite dangers connected with its use. Digitalis, which can very generally be continued indefinitely, is likely to remain the sheet anchor.

The drug must be given in adequate doses, 3 or 4 drachms of the tincture (3 generally suffices), or an equivalent of some other preparation, should be introduced into the system as quickly as possible.

Perhaps the best routine is to give an initial drachm and begin the 20 minim doses six hours later. As a rule the pulse comes down to below 80 in two or three days at the outside and the chief symptoms clear up very quickly. The drug is then discontinued for a few days and recommenced in much smaller doses—perhaps 10 minims once a day or on alternative days. The minimum dose to keep the pulse below 80 should be discovered, and then continued indefinitely.

If the symptoms fail to improve under appropriate treatment, the outlook is bad, but if they do improve, we may begin to let the patient move about the room, then on the same landing then out of doors—walking, or in chair or vehicle, but sleeping on the ground floor, or carried upstairs, though walking down, then walking up a short flight of stairs once a day, then twice, but always walking upstairs first and then down, before walking down and then up—and one begins with not more than half a dozen steps, perhaps at first taken walking backwards. The same rule applies out of doors on gentle inclines and later on steepish hills—always up first and down back, and always turning back as soon as distress begins.

Prior to the advent of gross evidence, such as swollen legs, albuminuria, enlarged liver, and obvious cyanosis heart failure is generally ushered in by breathlessness or pain. In either case no matter what the lesion, reduced effort as an initial step is essential, and, whatever the lesion, the amount of restriction must depend on the

urgency of the symptoms, which, if severe, point to a preliminary period of rest in bed for a few days or for a few weeks, and seldom, in recoverable cases, for longer, while in many instances the initial limitation need not be so extreme. Each case must be judged on its own indications.

Extra-systoles, easy of recognition, and the commonest cause of irregular pulse in adults, occur in hearts both healthy and diseased, but in an otherwise healthy heart they do not call for restriction of effort.

"Blood pressure" obsesses many doctors, and needlessly alarms many patients. One sees people die of cerebral hemorrhage with a pressure of 150, while many people with a pressure of 180 to 220, or even more, live for years in excellent health, until "the fear of death" is put into them by some member of our profession who tells them they have passed the "danger level," and they live ever after with the feeling of the rope around the neck.

By all means let early arteriosclerosis be recognized and reasonably treated and dieted, but do not let us put the fear of death into such people, or unduly limit their activities. All tissues retain their elasticity and life longer if they are kept in active use, and the author's belief is that these cases live longer and in better health if they are allowed to take such exercise as they find agreeable.

When the stethoscope had revealed the various heart sounds and their meaning became gradually elucidated, conclusions based on the integrity of the valves dominated cardiology for many decades and led to views many of which are to-day discredited.

With the advent of the polygraph and the electrocardiograph the myocardium has come into its own, and it now dominates. This is as it should be, and yet it is likely that some of the anomalies of myocardial activity revealed by the electrocardiograph, and on which discouraging conclusions are now based, will be proved by time to be either of a temporary nature or else of comparatively minor importance and well within the great reserves which the heart possesses.

The baneful and far-reaching effects of fear should ever be before us, as should be also the tonic effects of hope and reassurance, and the possibilities of improvement which come to all muscles, the heart included, when allowed free activity within the range of pleasurable reaction.

Each case must be looked at all round, no single sign should be given undue weight, but if there is any one point which may be allowed to override the others it is the one to which least attention is often paid—and that is the physiological capacity of the heart as proved, not so much by set tests, as by careful inquiries and cautious experiment as to the individual patient's capacity for effort in the ordinary calls of life.

Endocarditis Lenta

In the *Quarterly Journal of Medicine* for April 1923, No 63, p 263, Dr H. J. Starling draws attention to what he terms endocarditis lenta, a type of chronic or subacute endocarditis, usually met with in healthy men, especially seen in troops returned from the front, and often so insidious in character that it is overlooked. He sums up the characteristics of the disease as follows—

1 It occurs in individuals of fine health and physique who have had little or no previous illness.

2 The majority of those suffering from it have undergone a considerable degree of physical stress, e.g., those who were serving in the fighting line in the years 1916-17.

3 It is marked by an insidious onset, very slow progress, long duration, and, as far as is known, a fatal termination.

4 Rheumatic fever is not a determining cause of its occurrence, nor is there any infective agent known as its predisposing cause, except, perhaps, sepsis in the form of impetigo, boils, or wounds.

5 It may be present in a well-developed stage without the individual being in any way incapacitated for work. In such a case the patient may die from the

results of a massive embolus without having been aware that he had any disease of his heart

6 Its course may be afebrile throughout Pyrexia, when it does occur, is usually the result of emboli

7 Recovery is suspected to have occurred, but there are no definite proofs

8 The infection is primary in the endocardium The post-mortem appearances show evidences of infection, reaction, and healing, but no evidence of previous rheumatic endocarditis

9 It represents the dividing line between rheumatic endocarditis and other forms of infective endocarditis It resembles the former in its slow progress, formation of fibrous tissue, and evidences of healing, absence of necrotic change in the areas of infarction, and apyrexia It differs greatly from rheumatic carditis in the frequent occurrence of emboli, in the absence of myocardial infection, in its fatal termination, and in the marked changes in the structure of the valves

10 The infection is due to a streptococcus of very low virulence which can only infrequently be cultured from the blood, and can be found only with difficulty in sections through the affected endocardium

11 Its presence, even in an advanced stage, is so insidious that it frequently escapes recognition"

A case of Bilateral Iliac Abscess treated by Oxygen Inflation

By W ROSS STEWART, M B, F R C S E.,
MAJOR, I M S,

Staff Surgeon, Bangalore, S India
(*Edinburgh Med Jl*, July 1923, p 281)

In a case in which a diagnosis of bilateral iliac abscess was made and confirmed by obtaining a syringe full of tuberculous pus from the left swelling, it was decided to adopt the method of treatment recommended and described by Lieut-Colonel E Rost, I M S, namely, oxygen inflation (*Brit Med Journ*, 10th December, 1921, p 978) The apparatus selected was of the simplest character and consisted of an ordinary Potain's aspirator with a medium sized trocar and cannula, and an oxygen cylinder connected by rubber tubing to a wash bottle containing distilled water, which in turn could be connected to the aspirating needle

On 3rd May, 1922, under chloroform anaesthesia, a small incision of about 1 in in extent was made in the right flank over the swelling and the edge of the incision was well retracted The trocar was then plunged in an outward and upward direction into the right abscess cavity and the contents aspirated thirty-two ounces of creamy tuberculous pus were removed, after which the abscess cavity was felt to be quite collapsed Without removing the cannula, the tubing from the aspirator was disconnected, and that from the oxygen apparatus substituted The oxygen was then turned on, its rate of admission being gauged by the bubbling in the wash-bottle

The abscess cavity was inflated gradually, and the swelling reappeared When the sac was fairly tense and tympanitic the oxygen was turned off To prevent escape of oxygen a fine silk purse string suture in the external oblique fascia was run round the cannula and drawn tight as the cannula was removed The skin overlapping this suture was closed, and the wound then covered with a collodion dressing

A similar procedure was then carried out on the left side, and it was noteworthy that, although the left abscess swelling was originally larger in extent than the right, aspiration of the left side only yielded some sixteen ounces of creamy pus This suggested that the cavities communicated across the middle line Further evidence of this was forthcoming, for, when the pus from the left sac began to diminish, blood-stained fluid mixed with gas passed the glass inspection tube It was inferred from this that the oxygen inserted into the right sac

was beginning to be tapped Aspiration of the left sac was then stopped and oxygen inflation commenced as on the right side, and continued till the left abscess cavity was moderately tense to palpation The wound was then closed as on the right side

While still under chloroform the patient was again x-rayed in the hope of obtaining a clearer definition of the osseous lesion The x-ray showed quite clearly foci of disease in the 12th dorsal vertebra and in the 1st and 2nd lumbar vertebrae, while the presence of the oxygen in the sacs showed up as an ovoid shadow

Progress—The following day the patient complained of some pain in the epigastrium and of discomfort from the distension The oxygen was absorbed very slowly A tympanitic note was obtainable over the sacs for three weeks after the inflation All discomfort disappeared in about ten days Additional treatment by rest in bed, diet, and general tonic treatment was carried out, and a course of sodium morrhuate injections in increasing doses was administered On 17th June a tuberculous gland on the right side of the neck was removed Six weeks after the inflation the sac walls could only be palpated with difficulty, and no sign of filling up could be detected The temperature remained uninfluenced for one month after operation, but it has remained since 3rd June 1922 practically normal, accompanied by a marked improvement in general condition

Present condition 3rd July 1922—Two months after operation the patient looks well and happy She has put on weight, and is free from any discomfort She sits up in bed of her own accord and voluntarily adopts the sitting position She gets out of bed briskly and can walk about the ward freely The abscess cavities remain collapsed, and there is no sign of the reappearance of the pus The ankylosis in the dorso-lumbar region would appear to have been hastened, for although the range of movement is uninfluenced, all efforts at movement are readily attempted

ANNUAL REPORTS.

ADMINISTRATION REPORT, GOVERNMENT OPHTHALMIC HOSPITAL, MADRAS, 1922

Superintendent, Government Printing, Madras,
Price Rs 3-14-0

The annual report of the Madras Government Ophthalmic Hospital is always an event of importance in the ophthalmic world, and of interest even to the general practitioner and the report for 1922 by Major R. E. Wright, M D, I M S is as able and as interesting a document as its predecessors

During the year 3,756 in-patients and 15,967 out-patients were attended to conjunctivitis being the most frequent disease among the latter and cataract among the former, although glaucoma is an important third 2,961 operations were performed on in-patients and 2,946 on out-patients, the total number for senile cataract being 1,582 These figures alone shew the big scope of the hospital and the opportunities for original work and investigation In addition 199 medical students and 34 post-graduates were trained

Turning to cataract 1,124 cases were treated by the ordinary Madras operation with a complete success rate, 6/36 and better, of 88 per cent and only 18 per cent. rate of vitreous loss A most interesting analysis of 250 cases treated by Barraquer's operation is given 118 were delivered with ease and 56 with difficulty the capsule burst during attempts at removal in 36 instances, and the final results were—complete success 80 per cent., partial success 9 per cent., vitreous loss rate 9 per cent Of 124 cases examined at the time of discharge vitreous opacities were present in 94, and absent in 30 These results are admittedly worse and much worse than with the ordinary Madras capsulotomy method, but the Barraquer technique is still on trial and it is as yet too early to

come to final conclusions. Certain types of cases,—those with a bulging eye, a friable capsule, an immature cataract with a normal suspensory ligament, and Morgagnian cataracts—stand out as especially unsuitable for the new method. A beginner may find difficulty in avoiding entangling of the cup with the iris, and the pupil must be fully dilated in order to apply the cup to the anterior capsule cleanly. On the other hand when successful, Barraquer's operation gives remarkably good results.

The essential difference, writes Major Wright, between any intra-capsular method and the capsulotomy method is that, in the former the vitreous body is deprived of the support of the suspensory ligament and capsule, a partition which not only serves to retain the vitreous in position, but which prevents to a large extent invasion of the vitreous by cell elements which give rise to vitreous opacities. And vitreous opacities of an organised type tend to be progressive and incurable. The type of case dealt with in Madras is perhaps one much more liable to reaction than that encountered in Europe, but a study of after results with Gullstrand's slit lamp and the corneal microscope shews that with any intra-capsular technique there are almost always masses of pigment, not only on the surface of the vitreous, but extending back into its substance. Trauma to the posterior capsule plus invasion of the vitreous by proliferative types of cells may lead to a fibrillar network in the vitreous and subsequent opacities. It must not be forgotten that in traumatizing the suspensory we are probably traumatizing that region from which the solid elements of the vitreous itself spring. In this clinic we regard an eye as potentially lost in which a vitreous escape of any kind has occurred or in which vitreous comes to lie against the back of the section. Strictly speaking the result of an operation for cataract ought to be recorded at least 18 months after the section. In this way only will the truth be arrived at as to the permanent and lasting value of any method. This is a very difficult matter in this country." (Possibly the follow-up method by reply-paid postcards, as introduced in Pasteur Institute practice in India might here be useful. Recently an attempt has been made at the Calcutta School of Tropical Medicine to follow up the results in kala-azar cases discharged 18-20 months previously, by this system, and some 70 per cent. of replies have been received.)

Taking capsulotomy without iridectomy, 406 cases were treated by instilling eserine, instead of atropine, at the close of the operation. In 21 there was prolapse of the iris and in 25 the iris became adherent to the section. The pupil was therefore caught up to the back of the section in more than 11 per cent of such cases as against 3 per cent. in capsulotomy with iridectomy. The advantage of having a widely dilated pupil for the Barraquer operation drew attention to the fact that in many cataract patients the result of even repeated instillations of atropine before operation is a round but undilated pupil. An investigation of the response of the normal pupil to atropine and to homatropine, respectively, was accordingly undertaken. The results were to shew that atropine acts more quickly and more effectively, whether in single or multiple instillations, and in a weaker solution. The maximal dilatation with four instillations takes about two hours from the first dose, and four instillations of homatropine gave very little better results than one of atropine. "We could not hope, apparently, to get mydriasis with homatropine preparatory to operation, which could be rapidly converted to post-operative myosis."

The routine method adopted in the Madras clinic for preventing orbicularis spasm is infiltration with novocain along the line of the zygoma. For the past two years, however, attempts have been made to block the nerve at the stylo-mastoid foramen. In a few cases the result was an absolute paralysis, setting in within 20 minutes, lasting for three quarters of an hour, and ideal from the point of view of the cataract operator. The method deserves a further trial.

Major Wright notes that in general, cataract patients are senile in more senses than one. Glazed, somewhat

shrunk and atrophied conditions of the skin of the lower limbs were shewn by 1,107 out of 1,586 cataract cases. In young adults the outstanding conditions associated with cataract were diabetes and severe anaemia, the latter being due often to ankylostomiasis and not infrequently to syphilis.

Turning to instruments Henker's corneal microscope with Gullstrand's slit lamp (Zeiss) has been found to be of the very greatest value. No other type of perimeter has proved so speedy, so accurate, or so generally satisfactory as Lister's Mark's scotometer is very useful, but might be improved upon, and Messrs Down Bros., turned out for the hospital a new electro-cautery handle with a foot switch which has proved admirable. The current is turned on by the foot switch, thus avoiding the clumsiness of introducing the switch into the handle where attention has to be detracted at the moment of most delicate manipulation. With regard to electric ophthalmoscopes, since Colonel Elliot first introduced these instruments "the staff of this institution has seen numerous models spring up and fade away." The Morton Marple type is the best of all, but even here improvements are needed. Why should not electric ophthalmoscopes be fitted with as good lenses as in the older refracting patterns, whilst cheap and careless work with regard to the mounting of the mirror is characteristic of several electric ophthalmoscopes on the market.

There were 187 cases of sclero-corneal trephining during the year. This represents a drop of about 100 on 1921 and is due to the elimination in 1922 of those cases of glaucoma in which any ineffective condition of the eye could be traced. The number of iridectomies and iridotomies during the year shewed a corresponding rise of about 100. On the whole the type of case of glaucoma seen in Madras is very advanced, and in cases with associated uveitis temporary relief by iridectomy or iridotomy, with a thorough investigation of the constitutional condition and vigorous medicinal treatment seems better. Of 81 blind or almost blind cases,—some of them blind for more than six months,—there were 19 who shewed vision regained or improved as the result of trephining. Four out of 15 cases blind for more than six months regained perception of light.

Of more general work, operations, especially exploratory ones on the accessory sinuses continue to be an important feature of the work. There were 2,828 cases dealt with in the refraction room, and publication is promised of an analysis of "fundus cases" for the past four years. Syphilis accounted for 85 out of 213 such cases, and glaucoma for 45. It is indeed hard to overestimate the importance of syphilis in eye work. 164 cases were treated with N A B and allied derivatives during the year and 79 with mercurial cream. 920 Wassermann tests were carried out by the King Edward Institute during the year in connection with these cases and the results are of interest. The tests were carried out under the very best laboratory conditions and by thoroughly experienced workers in 83 cases with a clinical history suggesting syphilis the Wassermann reaction was negative, and in 121 cases with no clinical evidence of syphilis the Wassermann reaction was positive. (Major Wright is not alone in considering that the reaction does not deserve the position of a fetish to which it has attained, and the present day tendency in India to send all cases of skin diseases,—whether "sebhorrhoeic dermatitis" of streptococcal origin or psoriasis,—for a "Wassermann," and abide by the results, irrespective of clinical findings, is to be deplored.)

The report of the Pathological Section is full of interest. Space does not permit of a full review of this important section, but those interested, both from the ophthalmic and the pathological point of view, will find here of the limbus had penetrated Descemet's membrane, had invaded the iris in the neighbourhood of the angle, and had extended back in the uvea with a large mass of growth in ring form round the globe about the level of the ora serrata. Another specimen shewed epithelioma of the limbus with perforation and invasion of the uvea,

but with a comparatively normal posterior segment. A case of hydatid cyst of the orbit was reported in this journal for October 1922. A glioma of the third ventricle was a post-mortem specimen from a male adult of 25; the specimen was the size of an orange and during its growth had followed the course of the ventricular spaces.

Epithelioma of the orbit is not rare. From the limbus the growth is usually squamous epithelioma, whilst that from the lid margin and inner surface is more usually of a basal-cell character. Some of the lid carcinomata have been associated with xeroderma pigmentosa. Taken on the whole epithelioma of the orbit is of low malignancy, but may tend to recur after apparent extirpation. In such cases x-ray treatment leaves much to be desired and an opportunity for the use and trial of radium would be much appreciated.

Of individual cases recorded,—many of them illustrated by the collection of photographs with which the report closes,—a case of acute exfoliative dermatitis following NAB administration deserves mention. 12 cases of spontaneous dislocation or rupture of Morgagnian cataracts were observed; there was no history of trauma in any of them. Curran's iridotomy for glaucoma, tried in 8 cases, gave disappointing results. Macular keratitis shews a curious seasonal prevalence in Madras, rising to its maximum in June to September. Tuberculin, B.E. was tried in conjunctivitis eczematosa with fairly satisfactory results. A case of optic atrophy due to methyl alcohol poisoning occurred in a patient who drank methylated spirit which came from the Government Medical Stores. Blindness set in in 12 hours. 56 cases of keratomalacia were analysed; the main associated symptoms were enlargement of the liver, ulceration or steaminess of the cornea, xerosis of the conjunctive, marasmus, and night blindness. 35 cases out of 50 taken in as in-patients were treated with fresh liver juice, and put on from 1 to 10 lbs in weight. In a note on the much discussed question of the pathogenesis of this disease Major Wright notes as possible etiological factors, (a) the unsuitability in general of the diet, (b), the evidence of alimentary tract disturbance and (c) the frequent evidence of hepatic trouble together with the early age of the patients. "The degenerations which we see in these prematurely old patients are not confined to the cornea.

First we have the proven deficiency diseases due to absence of vitamins. Experimental keratomalacia comes into this group. Then we are familiar with enteritis and cachexia of quantitative insufficiency and indigestible food stuffs, and of the more acute alimentary infections. Endocrine functions become deranged, not infrequently we have amine-intoxication, with which a badly functioning liver may be unable to deal. The three factors, acting together, appear to produce a systemic degeneration, of which keratomalacia is a special and localised expression."

Rhinosporidium kitchineri (Secheri) is now regarded as the correct name. Ed.) infection of the bulbar conjunctiva with scleral staphyloma of the right eye was encountered in one case. In another there was a small rhinosporidial growth, measuring 7 by 3 mm., lying 9 mm. below the limbus in the left eye. These appear to be the first recorded instances of infection of the bulbar conjunctiva. In both there was an abrupt staphylococcal condition of the sclera immediately below the attachment of the growth.

Other interesting individual cases detailed in the report are a case tuberculous conjunctivitis, where the diagnosis was histologically proved, two cases of post-papillitic optic atrophy with associated pressure symptoms from cranial tumour, where decompression operations were carried out, both regained some vision in place of none. A most interesting table is given of the ten cases of bilateral enlargement of the lacrymal glands seen since 1910, and the etiology of the condition is discussed; it appears to be usually something more than simple hyperplasia, as the main elements of the growth are lymphoid and tend to recur. In three of the cases the condition was associated with leukemia of spleno-medullary type.

In all cases of optic neuritis or atrophy where no satis-

factory evidence was forthcoming as to the cause of the disease, the nasal and accessory sinuses were fully examined. One case only shewed sphenoidal sinusitis, ethmoiditis does not appear to be important, but on the other hand gross ethmoidal disease seems to be frequently associated with scleritis and uveitis without obvious cellulitis. With regard to plastic surgery Gillies' method of using epithelial outlays has been used on several patients where caustic quack remedies had destroyed the skin of or around the lids. In one instance the method saved both corners, which would otherwise almost certainly have ulcerated. In a case of epithelioma of the lower lid, Buedner's operation was carried out, the whole of the lower lid removed with a V-shaped incision and a composite graft from the skin and cartilage of the back of the ear used to replace the tarsus and conjunctiva. The result was excellent. Other interesting conditions dealt with and discussed are the exposure keratitis of old people, sunburn of the conjunctiva,—which is apparently not at all uncommon among Europeans,—and eclipse amblyopia.

Major Wright and his staff are to be congratulated on a most excellent addition to a valuable series of annual reports. The set of photographs fully illustrate the report and one of its most pleasing features is that whereas the administrative section only covers 12 pages, the professional report covers 41, an unusual and welcome precedent.

ANNUAL REPORT OF THE EXECUTIVE HEALTH OFFICER, BOMBAY, FOR 1922 BOMBAY MUNICIPALITY

THIS report, by Dr J. E. Sandilands, M.D., D.P.H., contains much interesting information on Indian urban conditions and is well worth study. Incidentally it contains two items which are a welcome novelty in reports of this type, a leaded summary of the statistics for 1922 on page in which is convenient for reference and a good alphabetical index.

The population of Bombay City, according to the 1921 census, was 1,175,914, living in an area of 23.54 square miles, and with an average density of population of 78 per acre. The very low birth rate in Bombay, 17.03 per mille as against 33 per mille for Bombay Presidency, is a point which demands attention. The factors concerned are several owing to the influx of male labour the proportion of the sexes is unusual, only 343 females to 657 males per mille of the population as against 474 to 526 for the Presidency in general, and the birth rate for women of child-bearing age, 75 per mille for Bombay City as against 151 per mille for Bombay Presidency, would seem to indicate unusual conditions. On the other hand there is prevalent in Bombay a very general custom for Bombay mothers to leave the city and proceed to their homes in the mofussil for confinement, and these births are registered in the mofussil areas, whereas the mothers really live in Bombay. Thus of 5133 infants which died in Bombay and where the registration figures were enquired into it was found that 23 per cent of these infants had been registered as having been born elsewhere. It is interesting to note that the mortality among infants who are not brought into Bombay until after they have passed the first few and most dangerous weeks of life, is less than that among infants born in Bombay. Inaccuracy of registration is a second factor in the figures, and it is estimated that some 2,000 births a year are not recorded at all. If these be added, the real birth rate should be 18.7 per mille, but even at this figure, and even when the above factors have been taken into account the low birth rate in Bombay City calls for some explanation. Attempts were made during the year to improve registration by the issue of leaflets and pamphlets in the vernaculars, and led to a considerable improvement on the 1921 figures. The period from August to January is that in which most births occur, and the birth rate among the Jain community was peculiarly low, only 4.85 per mille.

On the other hand the death rate was high, 31.06 per mille, and infant mortality contributed 8.236 out of the 37,297 deaths which occurred.

An unduly large proportion of the population of the city belong to the most poorly paid sections of society and among them the death rate is very high. In only 8,773 cases was the cause of death certified either by a registered medical practitioner, hakim or vaidya, the commissioner of police or the coroner. Diseases of the respiratory system head the mortality, and cause a death rate of 11.33 per mille of the population, dysentery second, 9.95, cholera third, 8.01, congenital debility and diseases of infancy fourth, 3.06, and ague and remittent fevers fifth, 2.25. The Lingaits, a small community numbering only 866 at the census, shewed 372 deaths and 115 births, probably the census figures for this community are too low. Mussalmans shew a death rate of 4.2, Hindus of low caste one of 4.0, Europeans one of 13.32, and Benias, the lowest on the list, 10.43 per mille. Small-pox is especially prevalent among Bhatias and Brahmans, and plague among the Jain community. The highest mortality occurred during the first four months of the year and was due to deaths from influenza, and epidemic plague. With regard to occupation the textile workers of Bombay, who are supposed by so many people to live in unduly unfavourable surroundings, but who actually do not do so, shew a mortality of only 16 per mille, as against one of 21 per mille for all persons aged 15 to 55 of employable age. Apart from infant mortality the chief mortality is among dependents of all ages. The medical, veterinary and dental professions—it is interesting to note—shew a mortality of 17 per mille, higher than that of the textile workers, the inference is justified that the conditions under which the textile workers and mill hands are employed in Bombay do not produce a high death rate, and that their health, as judged by mortality, compares favourably with that of the generality of workers of the same social class in the city.

Turning to infant mortality, although the figures are still high, 402.7 deaths per 1,000 infants born, the figures shewing a saving of 4,515 infant lives on 1921. If an estimated total of 6,109 infants born elsewhere and brought into Bombay within the first few months of life, and of some 2,000 infants born in Bombay, whose births are not registered, be added, then the true infant mortality in Bombay is really 288 per 1,000 births. Infantile debility, malformations and premature births as causes head the list, 3,681 out of 8,236 infant deaths, diseases of the respiratory system come second, 2,154 deaths, convulsions third, and enteritis fourth. 39 per cent. of the infant mortality occurs among infants less than one month old. In general the curve for infant mortality runs parallel with that for general mortality at all ages and plague plays an equally important part in infant as in general mortality. As compared with the figures for 1921 infant mortality shewed a decrease of 30 per cent, the chief factor being a lessened incidence of influenza. A striking instance, however, of the unreliability of vital statistics in India is provided by the figures for infant mortality among the Jain community, if the figures be taken as registered and as they stand without correction, they record 194 deaths among infants under one year of age to 118 births, or an infant mortality of 1,600 per 1,000 births! Among Europeans and Parsees, where registration is probably accurate, the rates are 149 and 143 per 1,000 births respectively. Even these figures are deplorably high when compared with the usual English rate of less than 90 per mille of births. In addition to the factors of poverty and ignorance which exist in Europe, as well as in India, other factors must be prevalent, dirty dais, malaria, even the prevalent custom of keeping troublesome infants quiet by the administration of opium.

Bombay is, however, taking vigorous measures to attempt to cope with the problem. 20 qualified midwives are employed as municipal nurses, and in 1922 paid 59,408 visits to houses, chawls and huts. 1,259 confinements were attended by them, the number of confinements unattended or attended by unskilled women was 66 per cent., those attended by qualified midwives or which took place in hospitals was 34 per cent., and

it is evident that even in India it is not impossible that some day the majority of confinements will take place under trained supervision. 1,784 women were admitted during the year to the three municipal maternity homes, and 1,627 confinements were therein supervised. The three infantile milk depots issued 21,358 seers of certified milk during the year, the five voluntary welfare centres are each in charge of a trained nurse and midwife, and gave advice and instruction to mothers, medical aid to infants, ran creches and employed a nursing staff who paid visits to homes. They dealt with 1,798 admissions and 128,169 attendances for distribution of milk or medicine, treatment or advice. It is clear that in Bombay, at least, the infant mortality problem is not neglected.

Plague was epidemic in 1922 for eight weeks in March, April and May. There were 759 attacks during the year with 632 deaths, and a mortality of 83 per cent. of cases. The total death rate from plague, however, was only 0.52 per 1,000 persons living, and represents a considerable improvement on 1921. The usual anti-plague measures were adopted, 755,938 rats were collected or destroyed and 185 per cent. found to be plague infected when examined at Parel, as against 3.37 per cent. in 1921. 10,226 persons were inoculated against plague. Small-pox was unimportant during the year, 61 deaths as against 406 in 1921, also cholera, 15 deaths as against 70 in 1921. 528 deaths occurred from influenza, but this is far less than the quinquennial average for 1917-1921 of 1,781 deaths. The King George V Anti-Tuberculosis League continued its activities throughout the year and dealt with 1,181 cases at its two dispensaries. Its medical officers paid 1,320 domiciliary visits, and the work of Dr A. K. Contractor, M.D., who has given his services as honorary radiologist to the League, deserves mention.

Malaria is becoming a problem of increasing importance in Bombay. 2,703 deaths were registered during the year as due to malaria or remittent fevers. In the military hospitals, however, there were only 793 admissions for malaria with 2 deaths as against figures of 2,474 and 16 for 1921, and even higher rates for 1919 and 1920. A spleen census of the children throughout the city shewed an average spleen index of 7.8 per cent, Colaba shewing the high index of 11.13 per cent. Fort North and Esplanade shewed especially high figures. The spleen rate in general has definitely risen since 1917-1921, and of 557 cases examined the parasite index was found to be 5.38 per cent. Free quinine and cinchona distribution were continued on a large scale during the year and 656 prosecutions instituted, in only 65 instances were fines inflicted (31 are still pending judgment). Notices regarding the protection of wells and cisterns were published in the local English and vernacular papers in May, and pamphlets circulated. Through the courtesy of *The Times of India* notices of mosquito-breeding haunts are published once a week gratis. Anti-malarial operations, and especially the filling in of the Naigaum tank, were considerably impeded by the prohibitive prices quoted, it is clear that the contractor in India is out to make the maximum profit—public health being a secondary consideration.

The League for Combating Venereal Diseases continued to carry out useful work. 1,595 cases were dealt with at its dispensary in Lamington Road. The twelve municipal dispensaries gave free medical relief to 71,020 persons during the year. Dr B. B. Broacha continued his voluntary services for the treatment of eye complaints among the poor at No. 8 District Dispensary until his untimely death in May. The department has lost in him an energetic and devoted worker. The free dispensary for eye diseases in Princess Street was attended gratuitously during the year by Drs D. D. Sathaye, N. N. Karami, R. D. Mody, and C. R. Athavle, and treated 342 cases.

The public health organisation of the city in general is divided into seven wards, each under charge of an assistant or deputy health officer, together with two assistant health officers in the central administration. These seven wards are sub-divided into 50 sections, each

in charge of a medical assistant, and the 50 sections are regrouped into 10 districts for registration and sanitary purposes, each with a senior and junior medical inspector. In addition there are the special staff of the dispensaries, 5 sub-inspectors for the milk supply inspection, the anti-malarial staff, and the veterinary and vaccination staff. During the year a new post of Dairy Superintendent was created. The milk supply is a serious problem in Bombay. 23,000 gallons are consumed daily in the city, an average per head of the population of 31 oz which is much below the figure of 5 oz for London and of over 11 oz for New York. 78 per cent of it is produced by milch cattle in stables within the city, 21 per cent comes in by rail and 1 per cent comes in by road from without the city. The milk from the cattle sheds within the city is fresh, but this is its only advantage. It is of the most dubious and dangerous quality, and produced under the most risky conditions. Experiments have shewn that pasteurised and safe milk can be brought in from places as far as 40 miles away, and one of the most urgent public health problems in Bombay is to do away with the milch cattle within the city and to establish reliable milk supply centres outside. 1,996 prosecutions were instituted in connection with offences under milk licenses, and 1,479 convictions obtained, an unusually satisfactory proportion for India.

In general the principal causes of the insanitary state of Bombay and its high death rate are the insufficiency of the water supply, the insufficiency of the sewers, the continuance of the basket privy system of conservancy, the density of the houses per acre and the overcrowding of persons in rooms and tenements. The water supply is being steadily improved, but the drainage system remains where it was ten years ago. A scheme of housing inspection has been organised with 50 medical assistants and 20 medical inspectors devoting not less than two afternoons a week to house inspection. Some 35,000 houses are inspected a year. The Development Directorate Scheme is working steadily towards the erection of a total of 50,000 new tenements for working classes, during the year 1921-22 1,969 new tenements were provided, and since 1898 23,356 tenements have been newly built, as against 25,028 old ones destroyed. The Corporation are working towards the provision of 8,000 tenements for their employees and the progress during 1922 in re-housing in Bombay is probably without parallel in any city of its size elsewhere in the world.

In the appendix to Dr Sandilands' report are included the report on the Arthur Road Hospital by Dr P T Patel, where there were 380 admissions during the year, and cerebro-spinal meningitis constituted one of the most important infectious diseases dealt with, 85 admissions with 57 deaths. The Maratha Plague Hospital was also in charge of Dr Patel and treated 597 patients during the year, as compared with 1,071 in 1921. Of these 234 were for plague and shewed a 77 per cent mortality, the various lines of treatment tried were with and without adrenalin orally, and with iodine intravenously and injected into the site of the bubo. The use of adrenalin orally does not seem to improve the results and even after use of the iodine method a mortality of 73 per cent is still recorded on 153 cases so treated. 98 out of 161 relapsing fever cases shewed positive blood findings on direct examination. The Municipal Laboratory, under the charge of Dr C Coutinho, examined 3,010 specimens during the year, of 2,866 milk samples examined no less than 1,760 were found to be adulterated, 614 per cent. The report of the Superintendent of Vaccination, Dr B B Darabsett, shews that 27,789 persons were vaccinated during the year, as against 38,608 in 1921. Primary vaccinations shewed a success rate of 86.39 per cent, and if unknown results be excluded the figure rises to 98.76 per cent., the cost per operation works out at Rs 1-10-3 per head, and amongst others there were 7,960 Haj pilgrims vaccinated out of 8,575 who embarked at Bombay.

Dr Sandilands is to be congratulated on a report which will be of considerable interest to all public health workers in urban areas in India, where the public health

problems which arise are often very different from those in mofussil and rural areas.

REPORT OF THE EUROPEAN MENTAL HOSPITAL, RANCHI, FOR THE YEAR 1922

By O A R BERKELEY HILL, M A, M D,
MAJOR, I M S,

*Obtainable from the Superintendent, Government
Printing, Bihar and Orissa, Patna*

MAJOR BERKELEY HILL's reports are always interesting reading, and the one for 1922 is no exception. The Ranchi Hospital serves not only for the Province, but for the whole northern half of India. Major Berkeley Hill was in charge, except for the period from the 20th March to the 10th November, when Major S C Chakravarty, I M S, held charge. The year saw a steady advance towards the hospitalisation of the former "asylum", the name was changed to "mental hospital," the term "block" has been discarded in favour of "ward," and a plea is put in for the employment of female nurses in place of male attendants. In 1922 a Board of Trustees was constituted to control and supervise the entire management of the hospital, whilst a notable event in the history of the institution was its affiliation during the year to the University of London in connection with the examination for the Diploma in Psychological Medicine.

At the beginning of the year 83 male and 64 female patients were in residence, and during the year 31 male and 21 female patients were admitted, 5 of them being voluntary boarders. There were 6 re-admissions, of whom three were cases which might easily have been cared for by their relatives, had they chosen to make any effort to do so. It is noted that patients not infrequently arrive with their admission papers and certificates wanting or incorrectly filled in. Two civil patients received, one male and one female, had previously been under observation in Alipore Central Jail. The practice in India of confining suspected insanies in jail whilst under observation, cannot be too strongly condemned, but there appears to be no alternative, until funds will admit of the addition of a psychopathic ward to the principal hospitals in India. Major Berkeley Hill also strongly condemns the practice of sending female European patients to Ranchi in charge of a police sergeant and an ayah, a qualified nurse is absolutely necessary in such cases.

In all during the year the total number of patients treated was 199, of whom 110 came from Bengal, and 59 from the U P. 19 per cent of cases to average daily strength were cured, and 1 per cent are recorded as improved. The interesting experiment was introduced during the year of granting two months' leave to improved cases, as a temporary measure, pending their final re-examination for discharge. A "welfare-enquiry" has been instituted, by which patients, after discharge are followed up every six months by letters of enquiry as to their state of health. Of 73 such cases, 29 were found to be living with relatives, and still unable to support themselves, 14 were supporting themselves in some career or other, 25 were pursuing their original avocations, and 5 were lost sight of. The lay idea that mental disease is incurable is far from being true.

The death rate for the year was 6.04 per cent, as compared with 8.52 per cent in 1921. The very difficult question of the removal of mental cases from India to the United Kingdom was again raised, under theegis of the European Association, and the War Office have now arranged for accommodation for such patients on all transports sailing from India for home. Here the English and Irish rules, under which a patient cannot be admitted to a mental hospital unless certified to be insane within 14 days of such admission, necessitate the re-certification of all such transfer cases on arrival in the United Kingdom.

Beyond that necessary for hydrotherapy, no sort of seclusion or restraint was imposed during the year. Therapeutic measures consist of occupational therapy, psycho-therapy and psycho-analysis, hydrotherapy and

organotherapy, paroles, amusements and rewards. Occupational therapy still continues to be the sheet-anchor of treatment, and here the utmost care is taken to provide such occupation as will really suit the case, the statistical forms in use are given, and the method adopted generally is along the lines adopted in the U S A. mental hospitals. When the psychological laboratory is finally completed it is hoped that it will provide a quiet and suitable place for psycho-analytical treatment. Hydrotherapy has proved of very great value in general treatment, it should be carried out in the patient's own room, as the fuss of taking a patient backwards and forwards to the bathroom is undesirable. Organotherapy, so much vaunted to-day for so many conditions, is on the whole disappointing. For epileptics a special chart is kept on which every fit is recorded, such a chart is useful in enabling the routine administration of bromides to be reduced to a minimum, whilst all epileptic patients are also kept on a salt-free diet. The parole system is working well, the lower grade or "river parole" permits the patient freedom within a certain area, the higher or "Ranchi parole" allows much greater freedom. Before being given parole the patient must sign a certificate that he will make no attempt to escape or to injure himself or others. There were 52 patients on parole during the year and no escapes or accidents happened. Major Berkeley Hill notes that in certain cases, where the sense of liberty has been atrophied by incarceration in Bhowanipour or elsewhere, patients granted parole are loath to "take advantage of it. With regard to amusements the recreation rooms are kept open till 9 p.m., once a week there is a concert and dance, a brass band has been inaugurated during 1922, and the installation of a cinematograph is under contemplation. Also a great deal has been done to improve the hospital gardens.

With regard to mental nursing the Superintendent writes that there is to-day in India a most urgent need for the creation and training of special mental nurses. However good a nursing sister may be, her training may be such as to be quite unsuited for mental work. At present there are 9,932 inmates of the mental hospitals and asylums of India, looked after by men and women, who, except in the rarest instances, have neither special training nor aptitude for such work. If a theatre sister is necessary in an operating theatre, a specially trained sister is not less necessary in a mental hospital. In the service of a mental hospital there is ample scope for "the flaming heart of a St. Theresa." But if such special and skilled attention is not available, the reason is not far to seek. There are eight ex-officio visitors to the hospital, during 1922 three of them actually visited it, the Commissioner of the Chota Nagpur Division, the Inspector-General of Prisons, and the Superintendent of Police, Ranchi.

Reviews.

A LABORATORY HANDBOOK OF BIOCHEMISTRY. By P. C. Raiment, B.A., M.R.C.S., L.R.C.P., and G. L. Peskett, B.A. (Oxon). Published by Edward Arnold and Co, London, 1922. Price, 5s. Pp 102

In this little book the authors have given both theoretical considerations and practical experiments in biochemistry in a very clear and simple style. It is essentially meant for students and we can safely recommend the book to them not only as preparatory reading before they begin their practical work in biochemistry, but also as a laboratory handbook.

The chapters on the proteins and carbohydrates are well written and will repay perusal.

In the chapter on the blood, the estimation of some of its important chemical constituents such as glucose, uric acid etc have been omitted. These ought to have found a place in a modern work on biochemistry and

we hope the authors will include these subjects in the next edition of the book.

An Outline of the Pirquet System of Nutrition By Dr. Clemens Pirquet. (W. B. Saunders Co., Ltd., Philadelphia and London.) 1922 Pp 96 Price, 10/- net

THIS little volume is a synopsis of Pirquet's "System of Nutrition," in four volumes and will be read with interest by all those who are interested in nutritional problems.

The first chapter draws our attention to what appears to be a very useful formula by which we may determine the average weight to be expected of an individual from the sitting height, viz, the cube root of ten times the weight in grammes equals the sitting height in centimetres. A relationship is also made out between the sitting height and the area of the absorbing surface of the intestines.

Instead of calories the "Nem" is coined. This unit is the nutritive combustible value of 1 gm. of average human milk. The advantages of using such a unit instead of the physiological heat value is not apparent, neither is the method by which the "Nem" value of foodstuffs is determined clearly stated. Certain short cuts are suggested which, to the reviewer's mind, destroy the whole scientific value of the unit in the majority of the cases quoted.

The author evidently would have us live according to formulae which in the reviewer's opinion only complicate the problem.

We must however thank him for making an outline of his work available to English readers, even if the only purpose served is to convince one that mechanical accuracy in nutrition, as in war, does not always spell victory. We can no more live according to formulae than the Germans could fight successfully according to formulae.

Principles and Practice of X-ray Technic for Diagnosis By John A Metzger, M.D., St. Louis: The C. V. Mosby Company, 1922 Pp 144. Price, 2s 7s

THE author's aim is to put into the hands of the student and operator a formula on which to base his work. This is done by means of a series of photographic illustrations of the various positions used in radiography and details of the exposure to be given in each case.

The method is a novel and useful one and the book should be of special value to the beginner in x-rays and may also be consulted with advantage by the more experienced operator.

Electric Ionization. By A. R. Friel, M.A., M.D., F.R.C.S.I. John Wright & Sons, Ltd., Bristol, 1922. 2nd Edition. Pp 132 Price, 8/- net.

THIS little volume is a complete guide to the theory and practice of medical and surgical ionization. Special chapters are devoted to the treatment of pyorrhoea, chronic suppurative otitis media, affections of the eye and nose.

The author has been inspired by Prof. Leduc of Nantes, the originator of this method of treatment. As is well known there are many medical men who do not accept all of Prof. Leduc's views, especially as regards deep penetration of ions. A fuller discussion of this subject would have been of interest, and would help to dispel the atmosphere of doubt which surrounds this interesting subject. Apart from this we have nothing but admiration for the work.

The practical details are given clearly and concisely and the illustrations are artistically executed.

This, the second edition, is considerably larger than the first and has been brought thoroughly up-to-date especially in the newer applications of the method, such as to chronic suppurative otitis media and nasal diseases.

Bronchoscopy and Oesophagoscopy. A Manual of Peroral Endoscopy & Laryngeal Surgery. By Chevalier Jackson, M.D., F.A.C.S., Professor of Laryngology, Jefferson Medical College, Philadelphia. 8vo. of 346 pages with 114 illustrations and 4 colour plates. Cloth. 27/6 net. W. B. Saunders Co., Ltd., London, 1922.

THIS book is based on the author's larger work, being prepared from an abstract made by a reader under the author's direction.

The complicated instruments required for the various procedures are carefully described, the author preferring tubes with the electric light fixed at the distal extremity. After dealing with the anatomy of the respiratory passages and oesophagus, the questions of anaesthetics and the position of the patient are discussed.

The operations of laryngoscopy, bronchoscopy, and oesophagoscopy are described in detail, with the numerous devices for removing foreign bodies from different situations. Many original manoeuvres of the author are illustrated and explained.

The book is an excellent guide for the surgeon who specializes in this branch, or who has to perform these difficult operations on occasions of emergency. Great stress is laid on the importance of constant practice. The English reader will not easily get accustomed to the so-called phonetic spelling—e.g., such words as 'maneuver,' 'technic,' etc.

An Introduction to Electro-therapy for the use of Students. By Catharine Jameson. London: H. K. Lewis & Co., Ltd., 1923. Pp. 196. Price, 6/- net.

THIS little book, written primarily for students preparing for the examinations held by the Chartered Society of Massage and Medical Gymnastics, forms an excellent introduction to the study of medical electricity for the student or practitioner who has not previously studied the subject. It gives all the details of the structure, care and use of electro-therapeutic apparatus necessary for the beginner. The methods of carrying out the various forms of treatment are described in more or less detail. The book is written from the point of view of the sister whose duty it is to carry out the instructions of the doctor in charge of the case, so there is but little discussion of diseases and the appropriate electro-therapeutic treatment. In this connection the authoress very rightly gives the following advice—"It must never be forgotten by those whose qualifications fit them to carry out treatments intelligently and successfully that it is not their business to prescribe treatment."

The book is clearly and concisely written and profusely illustrated. It can be confidently recommended to those for whom it is intended.

The New Physiology in Surgical and General Practice. By A. Rendle Short, F.R.C.S. (Eng.). 5th Edition. Bristol: John Wright & Sons, Ltd., 1922. Pp. 330. Price, 9/6 net.

THE first edition of this little volume was published in 1911. Since that time four editions have been exhausted. This fact in itself is a sufficient indication of the growing popularity of the work.

The author's aim is to "ring out the old and ring in the new" and he has succeeded so well that the book has not grown very appreciably in size since its inception. This does not mean that all the material excluded from the present edition is effete and useless, but merely that it is no longer new. Consequently the older editions may with advantage be retained and the reader of the present volume finds in his hands practically a new book.

Three fresh chapters appear in the present work. One dealing with the physiology of muscular exercise gives the latest theories about the contraction of muscle fibres and their bearing on training dietetics. The old idea of "beefsteak and beer" is thereby exploded. The physiology of the heart and lungs during exercise, the blood flow through the muscles, the rôle of adrenalin and the influence of the central nervous system are all touched upon.

The second, dealing with the functions of the kidney, reviews in some detail the theories of the secretion of urine, adducing the latest evidence in favour of the re-absorption theory of Ludwig. This is followed by short notes on the effects of blocking the ureters, nephritis and tests of renal function. This chapter on the whole is disappointing and scrappy. For instance no mention is made of high protein feeding and the description of tests of renal function is rather meagre. The third, on the causation of appendicitis, breaks new ground in attributing the malady mainly to the change from the old coarser home grown foods to the modern imported food-stuffs.

There are many other alterations in the present volume, all of which add to its value and interest and contrive to make the book still the most readable of all medical works.

Practical Anaesthetics for the Student and General Practitioner. By Charles F. Hadfield, M.B.E., M.A., M.D., London: Baillière, Tindall & Cox, 1923. Pp. 244. Price, 7/6 net.

THIS little book is intended to furnish the medical and dental student with sufficient theoretical and practical information to enable him to commence his course of practical instruction with a working knowledge of the usual methods. The directions are as practical as possible and every care has been taken to include the small manipulative details. Theoretical problems are only lightly touched upon, except in cases where the physiological action has a very practical bearing upon the actual dangers and methods of administration.

In the sections on the prevention and treatment of vomiting and delayed chloroform poisoning, we note that the value of glucose administered for three or four days prior to operation is strongly emphasised. The depressing effects, both physical and mental, of prolonged starvation and the necessity of taking into account the patient's mentality when ordering the details of preparation, are points often overlooked. A whole chapter is devoted to the subject of the airway, the causes of obstruction and the methods of dealing with each. Too much importance cannot be attached to this question, which is the cause of most of the troubles met with by the unskilful administrator, and the student who masters and puts into practice the advice contained in this chapter will have surmounted some of the worst difficulties of the anaesthetist.

The gas-oxygen-ether method with Boyle's apparatus is carefully described and its advantages and disadvantages are fairly stated. Useful as this method is in cases where severe shock is present it is *not* the method of choice as a routine anaesthetic. All the usual methods of giving ether by closed and open methods, rectal ether, Shipway's warmed ether apparatus and the endotracheal catheterisation apparatus are adequately described.

The administration of chloroform is described on the usual lines and the Vernon Harcourt inhaler is recommended though rather half heartedly, the author's preference for the open method being quite obvious.

The chapter on spinal anaesthesia is one of the best in the book, the advantages of and contraindications to this method being very clearly set out. The student is warned that spinal anaesthesia though indicated in cases likely to suffer from shock, is highly dangerous in cases already in a state of collapse or shock, on account of the fall of blood pressure which takes place.

We can cordially recommend this book. The information contained in it is concise, clear and accurate and the price is moderate.

CARRIERS IN INFECTIOUS DISEASES. - By Henry J. Nichols, M.D., M.A., Williams and Wilkins Co., Baltimore, 1922. 184 pp. 10 illustrations. Price 3/50 dols.

THIS book will be found most useful, not only by laboratory workers, but also by practising physicians, since the subject is treated from the broadest possible

point of view. The author rightly emphasises the necessity for co-operation of the physician and the laboratory worker. In the carrier question both, as also the sanitarian are all like concerned. Part I of the book deals with general considerations, and here emphasis is laid on the fact that carriers are not, as a rule, free from lesions; thus the diphtheria carrier often shows tonsillar lesions; the typhoid carrier's gall bladder is far from healthy, whilst his kidney may show acute and unsuspected lesions of pyonephrosis. In connection with the enteric group females constitute 80 per cent. of carriers.

The author rightly lays stress on the importance of obtaining duodenal contents for examination for typhoid carriers, and details the technique of use of the duodenal tube. Throughout the book the instructions for laboratory examination are full and detailed, also of special value to the physician are the detailed instructions as to how to take specimens for examination—a point too often overlooked in laboratory text books. In Part II the typhoid, cholera, dysentery, helminthic, diphtheria, meningococcus, pneumococcus, streptococcus, influenza and other carriers are dealt with in turn. In connection with diphtheria the author rightly lays stress upon the importance of ascertaining the virulence of the organism isolated, and the correlation of results with the Schick test. The remarkable work of Colonel Schorer in having 40,000 men of the 89th American Division examined for meningococcus carriers during the war is described. 102,170 cultures were made and 3,290 carriers detected and treated. In dealing with the pneumococcus the importance of typing isolated strains is explained, types I and II being those associated with epidemic pneumonia. There is an excellent account of the streptococci of the respiratory tract, thus of recruits from rural areas to the American army during the war only some 5 per cent. on enlistment showed haemolytic streptococci in their sputa but of those who had been for some months in crowded camps some 50 to 80 per cent. were infected.

The book concludes with a section on carriers in veterinary medicine by R. A. Kelsner, D.V.M., M.A., which is of special value. Here we have treated in turn organisms such as the *Micrococcus melitensis* which are pathogenic both for man and animals, and their relationship to each discussed; organisms pathogenic for animals and possibly pathogenic to man, such as the *Bacterium abortus*, certain trypanosomes and coccidia and organisms pathogenic only to the lower animals.

Throughout the book the best methods of treatment of identified carriers are described, and everywhere the carrier is considered also from the public health point of view. The veterinary sections will be of special value to veterinary surgeons and the selected bibliographies at the end of each section will be most useful to laboratory workers. The volume incorporates the results and lessons of the war and can be highly recommended.

COLLECTED PAPERS OF THE MAYO CLINIC, ROCHESTER, MINNESOTA, Vol. XII, 1920—
 Edited by Mrs. Mellish. Pp. 1392. Illustrated, 1921. W. B. Saunders Co., Ltd., Philadelphia and London.

These volumes of collected papers are now well known and embrace a very large number of subjects. The various authors are enthusiasts in their own subjects and work together in a clinic where co-ordination is the leading principle.

From the point of view of the reviewer the mass of material presented in the book is difficult to sort out without reference to each and every paper. The book is divided into sections, e.g., alimentary tract, urogenital organs, etc., whilst the last section is a general one and the volume concludes with descriptions of the conditions in the medical schools, hospitals, and research institutions in South America.

The reader is provided with a wealth of up-to-date medical thought and medical work which he cannot afford to neglect.

Correspondence.

KALA-AZAR IN BENGAL

To the Editor of THE INDIAN MEDICAL GAZETTE.

SIR,—A conference of the Medical Profession of Bengal was held under the auspices of the Central Co-operative Anti-Malaria Society Ltd., at the Calcutta Medical Club, 62, Bow Bazar Street, from 14th July to 17th July, both days inclusive. Sir Kailash Chandra Bose, President of the above organization presided over the conference on the 14th and 16th instant and Rai Bahadur Dr. Chuni Lal Bose, late Chemical Examiner to the Government of Bengal presided on the 15th and Dr. C. A. Bentley, Director of Public Health, Bengal, presided on the 17th instant. A large number of medical practitioners from Calcutta and the mofussil attended the conference.

After several papers had been read by several workers on the disease and after discussion the following resolutions were moved by Rai Bahadur Dr. G. C. Chatterjee and were unanimously passed by the conference:—This conference of medical men of Bengal has come to the following conclusions as the result of their deliberations:—

1 That kala-azar is prevalent throughout the province.

2 That as the two diseases malaria and kala-azar, are intermixed and can be distinguished only by experts it is not desirable to have separate agencies for dealing with the two diseases.

3 That it has been found after going through the record of work for three years of the Central Co-operative Anti-Malaria Society Ltd., that the co-operative anti-malaria and public health societies are the most efficient and most economical agencies for dealing with the two diseases and these being voluntary, have become very popular, so the conference recommends without any hesitation the acceptance of this method of prevention by the people and the local bodies and requests the Government to grant subsidies to these bodies.

4 That as the services of as many medical men as possible are required to treat kala-azar cases, it is desirable that every medical man in Bengal should offer his aid, either to the society or where there is none should start a centre for injections on his own account.

5 That as medical men have a clear idea of sanitary measures it is desirable that in every district, the sanitary sub-committee of District Boards be composed mainly of medical men who may or may not be members of the board. They should be given the right of distributing the sanitary grant of the District Board, in consultation with the Central Co-operative Anti-Malaria Society, to the public health societies.

6 That every year a conference like the present one, be held, of the medical profession of Bengal, for deliberation for initiation and for review of the measures adopted for the prevention of kala-azar and malaria, and a committee be formed to make arrangements for the same. The following are the provisional members of the committee:—(1) Rai Bahadur Dr. G. C. Chatterjee (Secretary), (2) Rai Bahadur Dr. Chuni Lal Bose, (3) Dr. Amulya Nath Mitra, (4) Dr. Jotirmoy Banerjee, (5) Dr. Dharendra Nath Banerjee and (6) Dr. Sudhir Chandra Bose.

7 That the conference appreciates the work done by the District Health Officers and recommends that they be given more facilities for carrying out sanitary work and also be provided with a small laboratory to help them in their work.

8 That the conference suggests the desirability of all medical officers of charitable dispensaries starting free anti-kala-azar treatment in their areas.

9 That as sanitation depends mainly on the economic condition of the people, it is desirable to promote the economic conditions by starting industrial concerns on

a co-operative basis or improvement of agriculture by co-operation. These co-operative concerns should be independent of public health societies.

10 That copies of these be forwarded to the Minister, Local Self-Government, Bengal, Director and Assistant Directors of Public Health, Bengal, Minister of Agriculture, Bengal, Chairmen of District Boards and Municipalities, Registrar, Co-operative Societies, Bengal, and other such bodies"—Yours, etc.,

G C CHATTERJEE,
Secretary

1-2-A, PREM CHAND BURAL STREET,
CALCUTTA

19th July, 1923

A CASE OF MOLLUSCUM FIBROSUM

To the Editor of THE INDIAN MEDICAL GAZETTE

SIR,—A gentleman consulted me regarding his wife, who was suffering from innumerable new growths over her whole body. On examination I found that they were typical pedunculated cutaneous fibromata of the kind known as *Molluscum fibrosum*, the largest being the size of a strawberry.

Personal History—The woman, aged about 30, has four children, the eldest being 10 years old. She first noticed some of these tumours after her first delivery. Since then they have been gradually increasing in number.

Family History—Her mother, aged about 55, is suffering from the same complaint. She also commenced to suffer from it after the first child was born. Her brother, aged about 35, has also the same trouble. He noticed the onset of the condition after puberty.

The husband desired me to answer two questions—whether his wife's condition was curable, and whether there was anything which could prevent the formation of new growths on his children's bodies. I, of course, could not say anything with certainty.

I shall be obliged if any of your readers will kindly inform me whether they know something more on the subject particularly with regard to the two questions raised by the husband, who is anxious regarding the future of his children.—Yours, etc.,

H R WADHWANI, M B, B S

JACOBABAD, SIND
15th July, 1923

[Note—The disease is not curable, except by removal of the tumours, which usually, as in the present instance, appear to be far too extensive for this to be attempted. If pigmented patches are present together with the cutaneous fibromata, the case is probably one of von Recklinghausen's disease and such cases often give a history of incidence of the disease in members of the same family.—Ed, I M G]

BRITISH INCOME TAX REFUNDS

To the Editor of THE INDIAN MEDICAL GAZETTE

SIR,—Now that the Finance Bill of 1923-24 has passed into law, no doubt your readers who derive any income from the United Kingdom will be interested to learn its provisions.

Briefly the most important changes affecting non-residents are these—

(1) The standard rate of tax has been reduced to 4/6 in the pound.

(2) Claims can be made for three years back but this limit will gradually be extended to six years. It will not be possible, however, to claim for years prior to 1920-21, the section not being retrospective.

(3) Income derived from the Irish Free State will be exempt from British Tax, but liable to Irish Income Tax, which is 5/- in the pound for 1923-24.

There are apparently still many people deriving income from the United Kingdom who are unaware that they can recover at least part of the income tax charged

on it. This is in many cases due to the fact that dividends are often marked "free of tax" and in some instances even no mention whatever of tax is made where they are paid through a local branch of a British Company. In both these cases, however, tax is recoverable.

Should any of your readers desire further information on this question, I shall be pleased to advise them if they will address me at 13, Buckingham Palace Gardens, London, S W 1—Yours faithfully,

WILFRED T FRY

16th July, 1923

TREATMENT OF OXYURIS INFECTION

To the Editor of THE INDIAN MEDICAL GAZETTE

SIR,—Will you or any of your readers kindly let me know through the medium of the *Gazette* of any effective and convenient method of completely eradicating thread-worms (*Oxyuris vermicularis*) infection in children as well as in adults? Repeated administration of santonin or oil of chenopodium, followed by saline purgatives has not done much good in my cases, except for slight alleviation of the symptoms for a few days only. Treatment with rectal injections of the bitter infusions such as quassia, calumba, etc., is troublesome and even out of the question in children who do not tolerate them at all for a number of days. As for adults, many of them are quite averse to this form of treatment. Of the few of my cases who submitted themselves to this treatment almost all returned after a few months in no way the better than before undergoing treatment.

In this connection I should also like to know whether these worms multiply in the intestines of the human body or whether they have any extra-corporeal stage in the process of their multiplication.—Yours, etc.,

P A NARAYANA IYER,
Sub-Assistant Surgeon

IRUKKUR,
23rd August, 1923

NOTE—Oxyuris is not known to multiply in the body. Re-infection takes place by scratching round the anus and buttocks, owing to the irritation caused by ripe females crawling on these parts. The females are killed by the scratching, but their eggs are conveyed to the patient's mouth by the fingers. Therefore, before beginning drug treatment, for some nights the skin around the anus and buttocks should be plastered with some strong smelling ointment such as ichthyol ointment. The best drug for treatment is pure carbon tetrachloride. The dose for an adult is m LXX given in two successive days and accompanied by a purge of magnesium sulphate. Treatment should be repeated a week later, the ointment being used freely in the interim. The real difficulty in eradication is the constant self re-infection. If this be kept in mind cure should be easy.—Ed, I M G

MEDICAL RESEARCH AND PUBLIC HEALTH, THE PRESENT POSITION IN INDIA

To the Editor of THE INDIAN MEDICAL GAZETTE

SIR—A body of "experienced and picked men of business acumen" known as the Incheape Committee, and some politicians in India have declared that expenses in these two departments are to be mercilessly cut down. That health is no more than the idle vision of a dream whilst suffering and disease are horrible realities, may be a religious dogma or a system of philosophy appealing to some, but, are the people of India willing to subscribe to such a doctrine? If so then the matter ends there. If they do not, then they have got to reject without delay all such short-sighted false economy. They have either got to take it lying down without protest, without demur, bow to the inevitable and resign themselves to the prospect of utter annihilation or protest and with one voice, say, No. They will have to decide whether they prefer to be a nation crippled with pestilence and disease, or

whether they would rather be a virile nation enjoying the benefits of health and vigour born out of the efforts of medical science. If they desire the latter and if money is not forthcoming, would they rather cut down expenses by doing without many unnecessary officials who draw exorbitant salaries and allowances or would they give them short shrift and make use of the enormous amount saved for the relief of suffering humanity by continuing medical research and public health organizations and by improving upon them? These are vital questions affecting the fundamental structure of the country, far more important than the quibble over the salt-tax or the constitution of the Reforms.

When Buddha, who was a young prince, asked of his father the gift "that he might always remain full of health, and that he should be smitten by no disease," his father, who was then king, is said to have replied, "In that, my son, you ask me what is beyond my power at present." From that day every religion has busied itself with the cure and prevention of disease. The hierarchy believed that the cause of these diseases was the influence of evil spirits or the visitations of God, and as remedies they prescribed sacrifice and prayer and anything that might avert the anger of God. From that small commencement of the campaign against disease, the prevention and treatment of disease, which for long was in the hands of religious authorities, passed into the care of those who employ the methods of scientific medicine, and the question naturally arises

What has Scientific Medicine done? It is outside my purpose to give a long exposition of this subject, but it is necessary to my argument to set out a few facts from which the reader may judge of the present condition of medical science. Doubtless the fear of disease has played a large part in pessimistic conceptions of the universe. In his statement of the case against this universe, and as a chief argument for his proposition that "this is the worst of all possible worlds," Schopenhauer, the great German philosopher, adduced the spreading of epidemics. "An alteration of the atmosphere brings about cholera or yellow fever or black death," he said, "and an alteration slightly greater might destroy all life." When he spoke of epidemics being due to slight changes of the atmosphere, Schopenhauer was obviously repeating the medical opinion current in his time. Experimental science has subsequently shown that he was quite wrong. It has been shown conclusively that cholera and plague are due to definite microbes. Koch discovered the cholera vibrio and Rogers showed the way to reduce cholera mortality by an astounding degree. Kitasato and Yersin discovered the plague bacillus in 1894. The natural history of the microbe has been studied, and we know that it may live not only in human bodies, but also in the bodies of small rodents, such as rats and mice which live in association with man. Knowing the source of infection, it is now a simple procedure to guard ourselves against it. We have not got to write retrenchment reports or to make laboured speeches in Council, but we have got to take measures to destroy rats and mice. Malaria, which was once supposed to be due to breathing air emanating from swamps or drinking water in certain places, has been definitely shown to be due to a germ. Ross has shown that certain species of anophelous mosquitoes transmit the infection, and the subsequent laborious efforts of Christophers and Stephens on the Royal Commission on Malaria and other workers have definitely shown that this fell disease admits of thorough eradication if proper measures are taken. It was nothing but research work on malaria that made possible the construction of the Panama Canal, and converted several hotbeds of malaria into more or less sanatoria. If India is losing thousands of its inhabitants every year from this disease alone, she has only got her politicians to thank for their pernicious parsimony in preventive medicine. The ravages of kala-azar have been reduced to a most remarkable degree in Assam by the excellent organization of the Public Health Administration. Dysentery and liver-abscess do not possess such terrors now for the people of India thanks to the emetine

treatment of Rogers. Instances could be multiplied a hundred times to show the benefits conferred on humanity by research work and public health organisation.

Conclusion—And yet a body of experts and wise politicians have advocated cuts in these two vital nation-building departments, which practically amount to the complete cessation of their usefulness. Twenty-five research officers and a handful of public health directors have been considered to be too many for a population of three hundred and twenty millions.

To modify the human constitution, it will be necessary first to frame the ideal, and thereafter to set to work with all the resources of science. If there can be formed an ideal able to unite men in a campaign against disease that ideal must be founded on scientific principles. And if it be true as has been asserted so often, that man can live by faith alone that faith must be in the power of science and of medical research—Yours, etc.,

B S CHALAM Capt,

Medical Sanitary Officer Bombay Development
Department, Reclamation Branch

24th August, 1923

Service Notes.

Copy of a Circular No 188E., dated the 18th July 1923, from the Personal Assistant to the Surgeon-General with the Government of Madras

THE following extract from G O No 1075-P H Ms, dated the 2nd July 1923, is communicated for the information of all officers concerned—

Indian Medical Service Officers, Civil and Military Assistant Surgeons, who desire to undergo a course of training at the Calcutta School of Tropical Medicine and Hygiene may avail themselves of the concessions admissible under the study leave rules. The Government will be prepared to consider individual applications on their merits for study leave from Sub-Assistant Surgeons. The officers who undergo any of the special courses at the Calcutta School, will be exempted from attending the Post Graduate courses which they will otherwise have to undergo in this Presidency.

APPOINTMENTS AND TRANSFERS

COLONEL C H BOWLE-EVANS, CMG, CBE, MB, was appointed Director, Medical Services, India, with effect from 6th September 1923.*

COLONEL H J K. BAMFIELD, DSO, Offg Director, Medical Services, India, appointed as Honorary Surgeon to H E the Viceroy, with effect from 9th July 1923.

LIEUT-COLONEL J S K. FLEMING, OBE, IMS, appointed Offg Deputy Director-General, I M S, with effect from 17th September 1923, during absence on deputation of Lieut.-Colonel R A Needham, CIE DSO, IMS.

LIEUT-COLONEL H AINSWORTH MB FRCS IMS, appointed President, Bihar and Orissa Council of Medical Registration, with effect from 3rd May 1923, *vice* Colonel H Austen-Smith, CIE, KHS MB, IMS, resigned.

LIEUT-COLONEL A B FRY, CIE, DSO, IMS, appointed to officiate as Surgeon-General with the Government of Bengal, with effect from 22nd September 1923.

MAJOR A H NAPIER, MD IMS services permanently placed at the disposal of the Government of Bihar and Orissa, with effect from 24th May 1923.

MAJOR A N PALIT, FRCS, IMS, services permanently placed at the disposal of the Government of Bihar and Orissa, with effect from 24th October 1923.

MAJOR DUNCAN COURTS, MBE, IMS services permanently placed at the disposal of the Government of Bihar and Orissa, with effect from 2nd December 1922.

* We regret to learn, since going to press, that Colonel Bowle-Evans has subsequently been compelled to take prolonged sick leave.—ED I M G

MAJOR G C HOWLETT, M B, I M S services permanently placed at the disposal of the Government of Bihar and Orissa, with effect from the 21st December 1922

CAPT H K ROWNTREE, M C M B, I M S, services permanently placed at the disposal of the Government of Bihar and Orissa, with effect from 19th October 1922

MAJOR M A RAHMAN, M R C S L R C P, I M S, services placed permanently at the disposal of the Government of the United Provinces, with effect from 6th August 1921

MAJOR R S TOWNSEND M C M D, I M S, services placed permanently at the disposal of the Government of the United Provinces with effect from 20th April 1923

LIEUT-COLONEL J H MURRAY C I E, I M S services placed at the disposal of the Government of Bombay for employment in the Jail Department, with effect from September 1923

CAPT J E DHUNJIBHOY M B I M S, services placed temporarily at the disposal of the Government of Bengal for employment as Superintendent, Central Medical Hospital, Berhampore with effect from September 1923

MAJOR D H RAI M C M D I M S appointed Professor of Materia Medica, King Edward Medical College, Lahore, *vice* Capt Amir Chand, M B, I M S granted leave

MAJOR E E DOYIE D S O I M S was appointed temporary additional Superintendent, Central Jail, Ahmedabad, from 27th March 1923 to 26th June 1923

MR K J MULLAN I M & S B M S to act as Civil Surgeon Surat during the absence on leave of Lieut-Colonel K V Kukday, I M S

CIVIL ASSISTANT SURGEON SAURINDRA KUMAR MAZUMDAR appointed to hold medical charge of the Civil Station Jalpaiguri, during the absence on leave of Major W O Walker M B I M S

LEAVE

CAPT P F GOW, D S O I M S, Resident Medical Officer, Medical College Hospital, Calcutta, granted leave for 12 months, with effect from 31st May 1923

CAPT AMIR CHAND M B I M S, Professor of Materia Medica, King Edward Medical College, Lahore, granted leave for 12 months, in continuation of the College vacation

LIEUT-COLONEL C C MURISON, I M S, granted extension of leave by 26 days, by the Secretary of State for India

MAJOR W O WALKER M B, I M S, Offg Civil Surgeon, Jalpaiguri, granted leave for 1 month and 9 days, with effect from 5th September 1923

LIEUT-COLONEL D MCCAY, M D, I M S, Offg Surgeon-General with the Government of Bengal granted leave for 1 month and 15 days, with effect from 22nd September 1923

LIEUT-COLONEL K V KUKDAY I M S, Civil Surgeon, Surat, granted leave for 30 days, with effect from 30th June 1923

PROMOTIONS

Lieutenant-Colonel to be Colonel

F L Blenkinsop, M B I M S

Major to be Lieutenant-Colonel

T F Owens, I M S Dated 31st August 1923

Captains to be Majors

R H Candy, M B, I M S, J C Barucha, I M S, H Hingston, M D, I M S, F J Anderson, M C, M B, F R C S, I M S, and R V Morrison, M D, I M S —Dated 27th July 1923

Lieutenants to be Captains

A I Cox, I M S Dated 18th January, 1922
H M Strickland, I M S Dated 22nd September 1922
J R Kataria, I M S Dated 16th October 1922
S D S Greval, M D I M S Dated 12th November 1922
R K. T Advani, I M S Dated 14th November 1922

RETIREMENTS

MAJOR-GENERAL SIR W R EDWARDS, K C I E, C B C M G, K H P Dated 8th July 1923*

LIEUT-COLONEL S H BURNETT, I M S Dated 31st May 1923

LIEUT-COLONEL E A R NEWMAN, C I E, I M S Dated 29th July 1923

LIEUT-COLONEL S H L ABBOTT, I M S Dated 9th February 1923

RESIGNATIONS

CAPTAIN H M COLLINS, O B E, I M S Dated 23rd May 1923

CAPTAIN O WILSON, I M S Dated 23rd July 1923

LIEUT H McNAIR, I M S Dated 14th August 1923

NOTICE.

ST ANDREW'S COLONIAL HOMES, KALIMPONG

ON page 111 of last issue will be found an advertisement from Dr Graham, the well-known Superintendent of the St Andrew's Colonial Homes at Kalimpong, advertising for the services of a fully qualified medical man or woman Dr Graham writes—"We are most anxious to secure the services of an experienced doctor who will be *really interested* in our 624 children There is also an adult community of about 70 workers, European and Anglo-Indians A keen young doctor might, perhaps, find the sphere of work somewhat limited, although there is a hospital with two European sisters and two probationer nurses We think that perhaps an older man or woman with good experience would be the best And an essential to success is that the doctor should be thoroughly in sympathy with the aims of the Homes"

We cannot refrain from especially bringing this appointment to the notice of our readers Dr Graham's work at the Kalimpong Homes is known throughout Bengal, if not throughout India So far from the sphere of work being a limited one, we consider that it might prove one full of interest and usefulness But it is obvious that the worker selected must be one with special qualifications, with a love for work among children, and with the true missionary spirit of service Our readers will, we think, join with us in the hope that the right medical man (or woman) will be forthcoming for this important appointment It cannot be too much emphasised that, at this present juncture, what India needs above all else is disinterested and loyal service

Notice.

SCIENTIFIC Articles and Notes of interest to the profession in India are solicited Contributors of Original Articles will receive 25 reprints of the literary pages of the *Gazette gratis*, if asked for at the time of submitting their manuscripts

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*We regret exceedingly to learn of the death from pneumonia of Sir William Rice Edwards in October, 1923, subsequent to his retirement.—Ed, I M G

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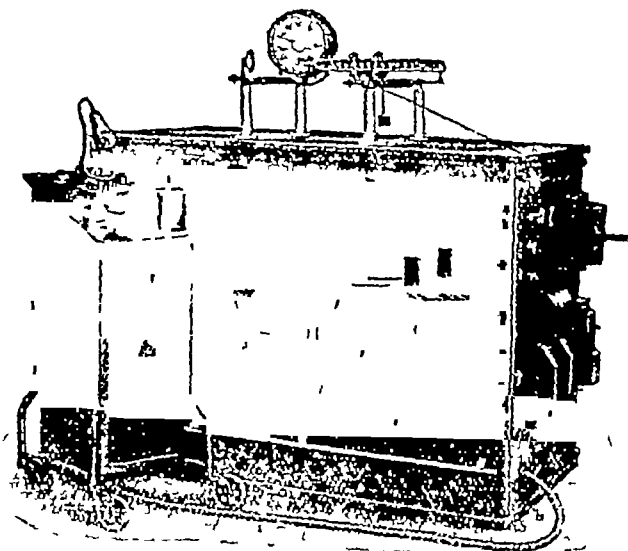
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Original Articles.

OUR PRESENT KNOWLEDGE OF INSULIN

By J P BOSE, M.B., F.C.S.,

Mitra Research Scholar on Diabetes Calcutta School of Tropical Medicine

Introduction—The discovery of a highly potent non-toxic anti-diabetic hormone is at the present day one of the outstanding features in the progress of practical medicine. The credit of the discovery is essentially due to Dr Frederic G Banting, a young Canadian doctor, working in collaboration with Dr C H Best at the Physiological Laboratory of the University of Toronto under the direction of Professor J J R Macleod, although numerous other investigators have been concerned in the later developments of the work.

The idea of preparing an active extract from the atrophied pancreas was conceived by Banting in November 1920, whilst reading an article dealing with the degenerative changes in the *acini* of the pancreas which followed the ligation of the pancreatic duct, but where the *islet* tissues did not undergo any degenerative changes at all. He was then struck with the idea that since the *acinous* and not the *islet* tissues degenerated after the operation, advantage could be taken of that fact to prepare, an active extract of the *islet* tissues. The hypothesis arrived at was that trypsinogen and its derivatives were antagonistic to the internal secretion of the pancreas. The failure of the other investigators who tried to prepare an active anti-diabetic hormone from the whole gland was thus accounted for.

It is not the purpose of this paper to give anything like a detailed historical survey of the literature underlying insulin therapy. A large number of eminent research workers in the past tried their hands on this subject, the results of their observations and discoveries, valuable in themselves, have contributed in no small degree to the success of Banting in his investigations and to his great discovery of "insulin" as a potent weapon, with which to combat the intractable malady. It would be entirely out of place to describe in this paper all the experiments that were carried out, and I content myself with giving a very brief outline only of some of the more important facts in connection therewith.

Arnozan and Vaillard—In 1884, Arnozan and Vaillard ligated the pancreatic ducts in rabbits and found that within 24 hours the ducts became dilated, the epithelial cells began to desquamate and protoplasmic changes took place in the *acinous* tissues. On the seventh day round-celled infiltration took place and the parenchyma was mostly replaced by fibrous tissues.

von Mering and Minkowski—In 1889, Von Mering and Minkowski, found that total pancreatectomy in dogs and other animals resulted in severe and fatal diabetes. They thus established the very important fact that the pancreas was responsible for this form of diabetes. This was really the foundation-stone on which the work of subsequent investigators has been built.

Sscobelew—In 1902, Sscobelew in Berlin repeated Arnozan and Vaillard's experiment and found that in addition to what had previously been established, there was a gradual atrophy and sclerosis of the pancreas, but no glycosuria.

From 30 to 120 days, however, after the ligation of the duct, he found the involvement of the *islets* and glycosuria.

MacCullum—In 1909 MacCullum ligated the ducts draining the tail-third of the pancreas and after 7 months, he excised the remaining two-thirds. This was followed by mild glycosuria. Three weeks later,

he removed the degenerated tail-third. The second operation resulted in an extremely severe and fatal diabetes.

Kirkbridge—In 1912, Kirkbridge repeated MacCullum's experiment and corroborated it. He definitely proved that the atrophic tissues (resulting from ligation of the duct) contained healthy *islets*.

Knobleton and Starling—In the same year, Knobleton and Starling published experiments which showed a marked decrease in the power of utilizing sugar of a diabetic heart outside the body, as compared with that of the normal heart under similar conditions.

Minkowski—The first attempt to utilize the pancreas therapeutically with a view to remedying the defects of carbohydrate metabolism was made by Minkowski. This worker tried the effects of pancreatic feeding with no beneficial results. Up to the present time, only useless and even harmful results have been obtained from repeated attempts to use this method.

The conclusions which one may draw from the work of the above mentioned workers may be thus summarized—

(1) That the secretions produced by the *acinous* cells of the pancreas are in no way connected with carbohydrate metabolism.

(2) That the injections of an extract prepared from the whole gland (as carried out by Murlin, Kleiner, etc.) as a therapeutic measure, is futile in remedying the defects of carbohydrate utilization.

(3) That the islands of Langerhans play a very important part in the control of carbohydrate metabolism.

Banting and Best's first Experiment—The pancreatic duct of an animal was tied and an interval of 10 weeks was allowed for the complete degeneration of the *acinous* tissue, after which the pancreas was swiftly removed by the Hendon method. After removal, it was sliced in a chilled mortar containing Ringer's solution. The mortar was placed in a freezing mixture and the contents partly frozen. The half frozen gland was then filtered through paper and the filtrate, having been raised to body temperature, was injected intravenously.

Results and Conclusions—(1) Intravenous injection of the extract of the pancreas, prepared as described, invariably exercised a reducing influence upon the percentage of blood-sugar and the amount of sugar excreted in the urine. (2) Rectal injections were, as a rule, not effective. (3) The extent and duration of the reduction varied directly with the amount of the extract injected. (4) Pancreatic juice destroyed the active principle of the extract.

"Insulin" from foetal pancreas—An attempt was next made to prepare the active extract from the pancreas of the foetus Ibrahim, among others, worked on this line, and could obtain no conclusive evidence of the presence of an active proteolytic enzyme in the pancreas of the human foetus until after the fourth month of intra-uterine life.

Carlson reported that in pregnant hitches near term, complete pancreatectomy was not followed by severe glycosuria until the young was born. The most natural interpretation of Carlson's result is that the pancreas of the foetus furnishes

to the mother an internal secretion which is necessary for the metabolism of sugar

It was these facts, coupled with the evidence afforded by previous experiments, that suggested the possibility that the foetal pancreas might prove to be the source of an extract rich in the internal secretion and yet free from the presence of the destructive enzyme of the pancreatic juice

A quantity of pancreas from foetal calves of less than five months' development was obtained. The tissues were macerated in Ringer's solution and the liquid filtered off. The filtrate was tried on several diabetic dogs and found to produce a marked reduction in the percentage of blood-sugar and the daily excretion of the urinary sugar. It was not found to contain any proteolytic enzyme

Mode of preparation of Insulin—Various modifications by different authorities have been introduced in the mode of preparation of insulin since its discovery. It is not the object of this paper to go into the details of the method of preparation. The first method employed for its preparation was the extraction of the active substance from normal ox-pancreas, using alcohol as a means of preventing the enzyme action, a method originally employed by Scott². The material thus prepared proved so potent in the treatment of diabetic dogs that it was tried on a severe case of diabetes in a boy of 14. The result was the reduction of blood-sugar by 25 per cent.³

The active substance present in these extracts received the name of "insulin". Considerable improvement in the method of preparation has been made by J. B. Collip and others⁴. Their process, which is now generally adopted, is a prolonged and rather laborious fractionation by means of alcohol.

Lately Harold Ward Dudley⁵ working in the department of Biochemistry, National Institute for Medical Research, has made further modifications by which insulin is said to be obtained in a much purer form. This method consists in precipitating the active material with picric acid and then converting the insoluble picrate into a soluble hydrochloride by means of an alcoholic solution of hydrochloric acid. This hydrochloride is a nearly white powder⁶ which 0.5 to 1 mg. will lower the blood-sugar of a 2 kilo rabbit (which has been starved for 24 hours) to about 0.04 per cent, and cause typical hypo-glycæmic convulsions.

Manufacture of Insulin—When the Toronto investigators found that the insulin which they had prepared was quite potent and useful in the treatment of diabetes mellitus, they adopted vigorous measures to prevent publicity of their method before the efficacy of the new preparation had been scientifically established. But in spite of all their precautions, the matter found its way in the public press, which heralded this discovery as a certain cure for diabetes.

When, however, the experimenters saw the possibilities of danger from the indiscriminate use

of the preparation, they patented the process for the purpose of protection. They realized, however, the difficulties of manufacturing insulin on a large scale, and so they entered into an agreement with E. Lilly & Co., Indianapolis, one of the leading pharmaceutical firms in the United States, to prepare it on a manufacturing scale.

Many other leading firms in England, such as Burroughs Wellcome & Co., Allen and Hanbury's, Boot's, etc., have now taken up the manufacture, and the output of insulin is steadily increasing.

The Properties of Insulin—Nothing definite is known about the chemical composition of insulin. As at present supplied, it is in the form of a crystal-clear solution.

When an aqueous solution of crude insulin is heated to 100°C. on a water bath for 10 minutes, a great deal of its activity is destroyed, but it seems to be surprisingly stable in an acid medium. It has been found that if it is similarly treated in N/10 H₂SO₄, it will withstand the treatment for 30 minutes without detectable loss of activity. After one hour's treatment however, some destruction of its potency takes place.

Its behaviour with alkalis on the other hand is entirely different. Heating to 37°C. for 1½ hours in N/10 NaOH destroys its activity completely.

It is readily destroyed by trypsin and Dudley notes that pepsin has similar properties.

It gives a marked biuret reaction, a positive xanthoproteic test, and a faint glyoxylic acid reaction.

Dudley has also obtained a positive Pauly (imidazole ring) and sulphur reaction which the Toronto investigators did not look for. He asserts, however, that when insulin is purified by precipitation with picric acid, almost all these reactions, excepting the biuret one, vanish or become insignificant.

One remarkable property noticed in insulin is that it has no influence in reducing the amount of sugar from drawn blood.

Pharmacological Assay—It was found by experiment that insulin lowers the percentage of blood-sugar in normal rabbits and this fact was taken as a basis for its standardization.

A unit of insulin is the amount which, on subcutaneous injection in a 2 kilogram rabbit that has been starved from 16 to 24 hours, can lower the percentage of blood-sugar to 0.045 per cent within 4 hours.

The reason why 0.045 per cent was chosen as the percentage to which the sugar should become lowered in this standardization is that at this level, almost without fail, the animal develops highly characteristic symptoms consisting of violent convulsive seizures with intervals of coma. These symptoms may finally terminate in death, which, however, can be prevented by the subcutaneous injection of dextrose (one gramme to one kilo of body weight).

Keeping Properties of Insulin—Insulin has been found to keep fairly well if it is kept in a

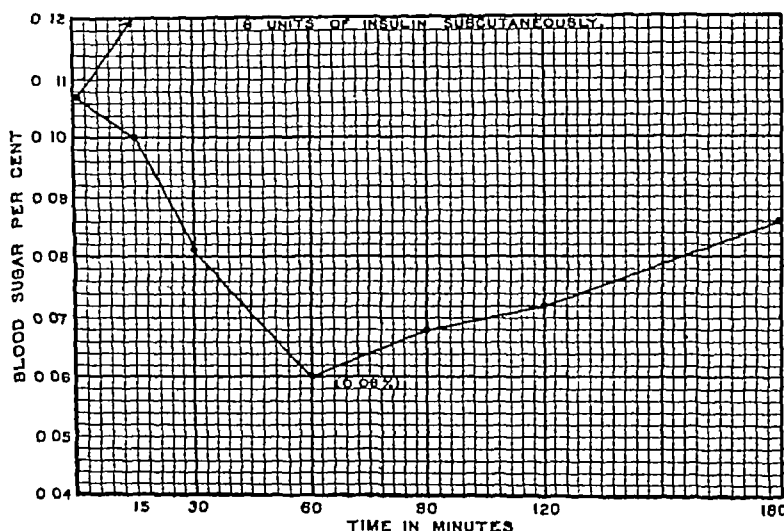
dry and cool place, and if precautions are taken not to contaminate it during use. The syringe and the needle should be absolutely sterile and the rubber cap on the ampoule should be sterilized by painting with tinct iodine first and then absolute alcohol, before the needle is thrust through to take the required dose out. It may, however, be stated that one of my samples kept at ordinary temperature for nearly two months gave as good a result as when it first came in, and this must have been several months after the actual manufacture of the product. The fact that it does not lose much of its potency during transit to this country is an additional proof of its keeping properties.

Action of Insulin on Healthy Individuals—Insulin, when injected subcutaneously or intravenously, causes a rapid fall of blood-sugar in normal individuals. When administered by the mouth or per rectum, it has not been found to be effective

per cent) took place in one hour's time, at this stage slight headache and weakness were felt.

(3) At the end of 3 hours the blood-sugar did not quite go up to the initial level.

On Diabetic Individuals—The action of insulin in reducing the blood-sugar content in diabetic patients however, is not the same, even if the dosage is kept constant. The degree of hypoglycæmia and the duration of the action of the drug vary in different diabetic patients and depend on the severity of the case and the extent of damage in the pancreas and liver. It is here that the danger of indiscriminate administration of the product lies, and this may well bring insulin into disrepute from its unskilful clinical application. Experiments show that, whilst in some cases an injection of 5 units of insulin given hypodermically caused no bad after-effects whatsoever, the same dose given to other patients under



The degree of fall of blood-sugar (hypoglycæmia) depends on (1) whether the individual had fasted before the injection was given and (2) on the dose administered. From a small number of experiments made on healthy individuals, it has been found that the dose being constant, the degree of hypoglycæmia produced is more or less constant and the maximum fall of blood-sugar takes place at about the same interval after the injection, though in one case in my series, some differences in results were obtained. This may probably have been due to individual variation or idiosyncrasy.

I tried a dose of 8 units of insulin (Lilly & Co, Indianapolis) on myself when I first got a supply from abroad. It was taken by subcutaneous injection 3 hours after breakfast. The results, graphically recorded in Chart I, will explain its action.

The noteworthy points about this chart are that—

- (1) The blood-sugar started to fall immediately after the injection.
- (2) The maximum fall of blood-sugar (to 0.06

exactly similar conditions caused severe symptoms attended with a marked fall in the percentage of blood-sugar. Chart II shows the effects of 8 units of insulin in a case of diabetes of moderate severity.

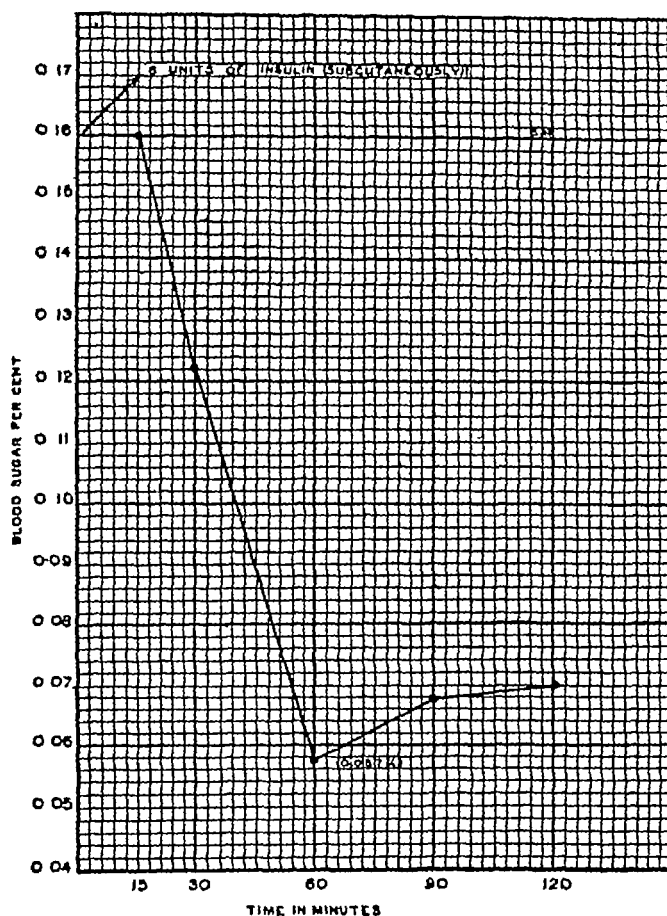
The noteworthy points about this chart are that—

- (1) The blood-sugar started coming down 15 minutes after the injection of insulin.
- (2) The fall of blood-sugar is quite precipitate.
- (3) The maximum fall (to 0.057 per cent) took place in one hour's time, at this stage the patient complained of rather severe symptoms, such as headache, weakness, nausea which lasted for nearly two hours, and was relieved after the patient had his breakfast.

How Insulin Acts—In the present state of our knowledge, it is difficult to say with certainty how insulin acts in diabetic individuals. It is quite possible that it helps to restore the glycogen-storage of the liver, which is lost in bad cases of diabetes. It also makes the tissues capable of consuming more sugar by supplying the "missing amboceptor" (according to Allen) in which they

are deficient, thus bringing down the sugar-content of the blood and effecting the reduction of the glycosuria

As I have stated above, in severe diabetes, the liver-storage of glycogen is nearly lost, in consequence of which the hypo-glycæmic condition fol-



lowing on the injection of insulin in such cases becomes much more prolonged than in the case of patients who have a larger store of glycogen in their liver. The rise of blood-sugar after about $1\frac{1}{2}$ to 2 hours is due to the neutralizing effect by the liberation of sufficient glucose from the glycogen-stores of the liver and muscles. In addition to restoring the blood-sugar level in diabetics to normal, insulin tends to restore the respiratory quotient to a normal figure. It also causes rapid disappearance of the ketone bodies from the urine. In one of the cases of diabetic acidosis in my series, which showed a well-marked Gerhardt's reaction (diacetic acid) and a strongly positive Rothera's (acetone bodies), one injection of 4 units a day for two succeeding days caused complete disappearance of the diacetic acid from the urine and reduced the strongly positive acetone reaction to a faint positive. After the third injection (5 units this time), the acetone bodies disappeared from the urine altogether. The blood-sugar was reduced from 0.486 per cent to 0.216 per cent after the third injection and the urinary sugar fell from 5.5 per cent to 2.6 per cent. The patient looked much brighter and himself admitted that he felt a sense of general well-being. The headache and nausea which were disturbing the patient very much, disappeared altogether.

Another patient with a sloughing gangrenous ulcer of the right toe which, before insulin was started, proved obstinately intractable, improved marvellously under a course of insulin treatment. He has had six injections so far (5 units each time on alternate days). Not only has the course of the disease been arrested, but the ulcer has nearly healed, and it is hoped that another couple of injections will cure it completely.

As far as one can judge, it appears that during the period in which insulin is administered, the metabolism of glucose, even in the worst cases of diabetes, tends to return to normal.

Indications for use of Insulin—Insulin is not indicated in all cases of diabetes. Mild diabetic cases who can remain sugar-free on a diet which satisfies their basal requirements do not ordinarily require insulin treatment.

When a diabetic patient comes under treatment, after the necessary preliminaries, such as taking careful notes of the case, thorough examination of the patient, especially with a view to finding any focus of infection, etc., he should be placed on a diet which will satisfy his basal caloric requirements. This can easily be calculated from his age, height and weight. Roughly speaking, a normal person requires about thirty calories for each kilogramme of his body-weight under basal conditions. The caloric value of the food given to him can be easily calculated from any diet-table.

The fasting blood-sugar estimation and a thorough urine examination are next made and, if possible, a glucose tolerance test is done to ascertain the patient's tolerance for carbohydrates before the insulin treatment is started.

All these will help to adjust the dosage of insulin to be given to the particular patient, which is a very important factor in the successful treatment of the case. The dosage should be adjusted in such a way that the hypo-glycæmic symptoms do not occur, but at the same time, the blood-sugar should fall below the threshold-level in respect to excretion of sugar in the urine, if not to the normal. It is here that the difficulties of insulin treatment are experienced. Next, having kept the patient on a fixed diet for 2 or 3 days and having calculated how much sugar he is excreting in relation to the total amount of carbohydrates he is getting in his food, the dose of insulin is calculated. Roughly speaking, one unit of insulin can utilise 25 grammes of carbohydrates.

In a certain number of bad cases where the daily excretion of the urinary sugar fluctuates even on a fixed diet, the initial dose of insulin may be difficult to determine. In such cases it is best to start with a moderate dose (say 4 units), gradually increasing it until the desired effect is obtained. The aim in insulin treatment should be directed to keeping the blood-sugar level as near the normal as possible, this being really the key to the successful treatment of all cases of diabetes mellitus.

Contra-indications—Insulin is absolutely contra-indicated in that special type of glycosuria known as 'renal glycosuria,' in which, though the blood-sugar is normal or even subnormal, the patient excretes a lot of sugar in the urine.⁶ It is also contra-indicated in some of the mild glycosurias of pregnancy.⁷

Symptoms from over-dosage—Experiments on animals have shewn the following to be the symptoms of hypo-glycæmia due to an over-dose of insulin—

(1) Violent convulsive seizures in which the animal throws itself over sideways with the head retracted and the hind limbs in an extended position. This condition is somewhat similar to strychnine poisoning or to acute asphyxia. Logan points out that there is a remarkable resemblance between an insulin convulsion and an asphyxial condition, and that the arterial blood is invariably extremely venous in colour when the convulsions supervene. It is possible that through the lowering of the blood-sugar, certain oxidative processes become depressed to such a degree that the brain cells are affected in much the same manner as in asphyxia.

(2) Very rapid shallow breathing

(3) Unconsciousness

It will thus be evident that it is most important that those using insulin therapy should be thoroughly conversant with the bad symptoms which follow an over-dose. These may, however, vary from a slight headache to very well-marked vaso-motor disturbance (flushing of the face, giddiness, profuse sweating, rapid feeble pulse, a sinking sensation, etc.) or even coma.

Treatment of hypo-glycæmia—The reactions resulting from the over-dose of insulin can be immediately relieved by the administration of 50 to 100 cc of fresh orange juice by the mouth. 25 gms of glucose with orange or lemon juice is better still. If the patient is unconscious, 0.5 cc to 1 cc of adrenalin (1 in 1,000) should be given hypodermically and as soon as the patient is conscious, he should be given glucose by the mouth. As an extreme measure, glucose may be given intravenously.

In conclusion, it may be stated that although insulin cannot yet be regarded as a permanent curative agent for diabetes mellitus, it has a very promising future before it and has so far proved to be a very valuable instrument in the hands of the medical profession to combat the severe forms of diabetes mellitus.

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THE THERAPEUTIC VALUE OF INTRAVENOUS IODINE

Based on three years experience on 400 cases

By W W JEUDWINE,

LIEUT-COLONEL, I M S,

Civil Surgeon, Delhi

PART I

INTRAVENOUS iodine has been in use for several years by a few medical men, and three previous notes have appeared on its use in the *Indian Medical Gazette*. The article by Major Porter in May 1921 was the first note that I saw of this method of treatment. I have been using this treatment since 1920, and the results obtained are herewith set out.

I admit that from a scientific point of view, the results are not fully worked out, but it has been impossible to carry out thorough scientific investigations in addition to my routine duties.

The Rationale of the Treatment—The benefit of the treatment appears to be due to a rapid hyper-leucocytosis which comes on within 24 hours after an injection of 10 minims to 2 cc. of iodine solution as given below. How much is due to the iodine and how much to the leucocytosis, I am not prepared to say, but I fancy that as the leucocytosis is permanent for some months and as the amount of iodine used is very small, the leucocytosis is the greatest factor in the treatment.

Preparation of Iodine and Dosage for General Use—When I began this treatment, I used 5 m of tincture of iodine in 10 cc of distilled water, but for various reasons, I determined to give larger doses.

1 cc of tincture of iodine contains, roughly, half grain iodine, and of this 1 or 2 cc can be given, diluted up to 10 cc, as a single dose.

Another preparation consists of potassium iodide 36 grs iodine 24 grs and water to the ounce. 1 cc of this equals, approximately, one grain of iodine, and of this, 1 to 2 cc in the same dilution can be given.

A third preparation is the tablet preparation by Messrs Smith, Stanistreet & Co, known as Nesfield's water sterilising tablets, each one of which sets free one grain of iodine. These are given in the same dilution.

Cases can be treated with any of these preparations and the same effect produced in all cases. There is no apparent choice of any preparation.

Technique—If an ordinary "Record" syringe with a needle attached is filled with the iodine solution, and a vein punctured, certain difficulties may be encountered.

(1) It is sometimes difficult to be certain that you are actually in the lumen of a vein. In giving salvarsan some blood flows up the needle and indicates that you are there, there is a distinct red and yellow of blood and salvarsan, but with iodine solution it is different. The iodine is a dark red colour, especially if 2 cc of solution are used, and in a bad light it is difficult to see if any blood, as

infections of all kinds, and whose tissues heal slowly when injured. It would be interesting to observe whether this class of case has a low leucocyte count, and also before operating on patients with a low leucocyte count it would be useful to produce a hyper-leucocytosis.

PART II

REPORTS OF CASES

Corneal Ulcers and After Cataract

Corneal Ulcers 24 cases—24 cured

After Cataract 8 cases—8 cured

I found that corneal ulcers healed up rapidly with this treatment.

Cases of inflammation of the cornea after cataract operation, and cases where some lens tissue remained in the anterior chamber improved quickly.

Tuberculous Glands in the Neck

In these cases there is no immediate improvement when the glands are large. Observations are difficult to make in patients who do not return to be seen. There is some improvement in early cases, the glands become more tender at first, but that soon subsides and the glands themselves become smaller, in cases where there is a chain of definite thickening with tiny glandular enlargement, the results are good.

Early cases do well, cases, where large masses are not evident, improve. When a sinus is present, or a caseating gland, a preliminary operation must be done.

Carbuncle

Cases treated 6—Healed 6

It may be said that all carbuncles if properly treated surgically, will heal up in the ordinary course of events without any further interference. I agree that they do so, but they take a long time if the area infected is large. In India people do not come for operation if they can avoid it, we consequently see all diseases in very advanced stages.

The treatment of this class of case with intravenous iodine gives excellent results with rapid healing and separation of the sloughs.

I will only quote one case.

Kushal Das, aged 80, was operated on at Kartarpur for an enormous carbuncle on the back of the neck, excision of the carbuncle. Seen by me on 12-12-21 when there was an extensive slough over the whole of the back of the neck. Injected 2 c.c. of solution "B" (Iodine two grains). The sloughs cleared up in three days and he left the hospital seven days later with the raw area nearly healed. Leucocyte count 17,000.

Chronic Ulcers

Cases treated 24—Cured 24

These cases give excellent results when treated by intravenous iodine. Healing is rapid. Sloughs separate quickly and patients who have been suffering for months are cured in a few days.

(1) Ghulam Khan, aged 46. Suppurating ulcer, right leg, about 4 in. by 3 in. Large varicose veins. Duration 10 years.

22-4-1922 Injection 2 c.c. solution "B"

2-5-1922 Healing quickly

16-5-1922 Injection 2 c.c. tincture of iodine

Leucocyte count 16,000

Area almost healed

(2) Duvani Motor driver to Colonel Finley A Pathan, aged 25. Sore on base of penis after connection. Six days duration. Glands in both groins enlarged and tender.

Seen 13-5-1922 Injection 2 c.c. solution "B"

Seen 22-5-1922 Sore nearly healed. Glands in groin disappeared.

He had no other treatment and continued at his work.

(3) Bingha Boy aged 14 years. Had his right hand and arm crushed in a mill. Brought in for ampu-

tation. The radius was fractured, the tissues crushed and suppurating, the hand swollen, the whole wound dirty. He was put under chloroform and the whole area cleaned up as thoroughly as possible.

All dead hanging tissue removed. Put up in splints. Injection 2 c.c. of solution "B".

Five days later the sloughs had disappeared, the wound healed up and the patient left hospital with a practically useful hand.

These cases were nearly all treated with the strongest solution. Boys of 14 and 16 were not affected by the large dose, nor was the patient of 80, with the carbuncle.

Cellulitis

Cases treated 7—Cured 7

These cases are on a par with the previously mentioned ulcers and carbuncle, except that the condition is a more acute stage of inflammation of the tissues.

I will only mention one very bad case.

Chanon, aged 25 years, in Rawalpindi Jail, was admitted to hospital on 13-6-1921, suffering from cellulitis of the left leg. There was considerable swelling, etc., over the front of the left leg, with oedema of the foot. The affected part was freely incised. There was very little discharge.

16-6-1921 Cellulitis very severe

17-6-1921 Foot very swollen. Calf of the leg hard and painful. Incised.

18-6-1921 No improvement. May require amputation.

20-6-1921 Injected 2 c.c. of solution "B"

21-6-1921 Temperature had fallen to normal within 24 hours.

Leucocytosis 18,000. Brawny swelling in the leg diminished.

Foot seems more swollen but less hard.

Patient says he feels better.

1-7-1921 Injected 2 c.c. of solution "B"

12-7-1921 Ulcer rapidly healing with a clean base. Swelling of foot almost disappeared.

25-7-1921 Healed. Discharged cured.

This was a very severe case of cellulitis which was treated in the ordinary way from the beginning. The tissues were freely incised. The patient was kept in bed and given extra diet. Boracic fomentations were applied and still the patient was getting worse.

There was an immediate improvement within 24 hours of the first injection. The intermittent temperature ceased after the second injection.

This case illustrates the benefit derived by this treatment in a remarkable way.

Enlarged and inflamed glands in the groin probably venereal.

Cases treated 2. Cured 1. Improved 1.

These cases were treated with 1 c.c. of tincture of iodine in 9 c.c. of distilled water. Improved very rapidly.

Chronic Arthritis

Cases treated 6. Results not known, owing to patients not remaining under treatment. One case, under observation for one month, seemed to improve. Further investigations, with repeated small doses, may possibly do some good.

Rheumatism

Cases treated 3. Results not known.

Here again investigation requires to be carried out. I can give no results.

Plague

Intravenous injection of tincture of iodine in small doses has been given in cases of plague, years ago by Capt (now Lieut-Colonel) F. P. Connor, M.S. I have not seen the report. I have been through two plague epidemics in Indian towns, in Multan in 1903, and in Delhi in 1923. In both cases the mortality of reported cases was about 50 per cent. Special note should be taken of the word "reported".

In Delhi this year, I found that as the reported plague cases increased, so did the deaths reported from

"fever" Nobody, unless he has worked in an Indian city, can appreciate the difficulty of arriving at a correct estimate of the causes of death, but it is probable that a large number of deaths reported as "fever" were in reality, plague cases. Every sort of allopathic, homeopathic and indigenous form of treatment was tried, but we are here concerned only with the effect of intravenous iodine.

Sub-Assistant Surgeon R. S. Hari Ram reported 26 cures out of 28 cases treated in the early stage. He told me he was using 5 minims of some preparation containing iodine and potassium iodide which he had seen advertised, probably Lugol's fluid. He gave injections on two successive days. I told him to use 1 c.c. of tincture of iodine, but he never gave more than 10 minims, and found he had good results. He said that in late cases it was useless.

Sub-Assistant Surgeon Gian Chand reported in the same manner.

I injected several cases myself using 1 or 2 c.c. of tincture of iodine, and advised the same treatment when called in for consultation.

Only early cases were benefited.

I found that hard buboes came rapidly to a state of abscess. The abscess was opened and pus evacuated. Healing was rapid.

In any future epidemic this method of treatment should be given a fair and extensive trial to establish its efficacy or otherwise.

Septic Lung

Cases treated 4—Cured 4

These four cases are the most remarkable of any, and the results obtained from them alone justify the publication of this form of treatment and strengthen my advocacy of further scientific investigation.

I have called them "septic lung," as in only one case were any tubercle bacilli found in the sputum and that only once after several microscopical examinations of the sputum.

Case 1—This was the first "lung" case I treated. I admit that it was an experiment but the patient was in a desperate condition and any treatment seemed justified.

H. K. a young Pathan aged 24 in Rawalpindi Jail a well-built man, reported sick on 10-7-1921 with fever and cough and profuse expectoration. On admission his physical signs of disease were profuse moist sounds in both lungs and he was treated for bronchitis. His weight on admission was 139 lbs. He continued to be ill and did not improve on any medicine. A diagnosis of tuberculosis of the lung was made and he was placed in the tubercle ward to await transfer to the Tuberculosis Jail. He rapidly became worse and his expectoration was profuse, filling a large earthen "gumlah" every day. Both lungs showed diminished resonance and were full of moist sounds all over. He was so ill that he was unable to travel in August when the other tubercle cases were transferred. He was reduced to a skeleton and his weight on 10th September was 81 lbs. He was practically bed-ridden and could not stand without assistance.

On 15-9-1921 in desperation I gave him 2 c.c. of tincture of iodine intravenously. From that day he began to improve. He never got another rise of temperature except for 3 days (about 10 days later) which reacted to quinine. His sputum which had been profuse rapidly ceased, and by the 22nd September ceased altogether.

His weight for the first week after injection remained stationary, 81 lbs. It gradually increased, and by December 1921 he had regained his full weight. The physical signs in the lungs rapidly cleared up.

I had this man under observation in Jullunder Jail up to September 1922 and he was then in perfect health. His leucocyte count was done on two occasions. The first count in September 1921 was 18,000. The second count in February 1922 was 10,000. In October 1921 I showed the chart and case sheet to Colonel (now Major-General) R. Charles MacWatt, C.B.E. I.M.S.,

who was then Inspector-General, Civil Hospitals Punjab, and to Colonel Ellicot Ward, C.B.E. I.M.S. Inspector-General of Prisons, Punjab. I showed it as a case of tubercle and I then thought that I had discovered by accident a cure for tuberculosis. Colonel MacWatt suggested that it might be a case of "septic lung" as tubercle bacilli had not been found in the sputum and in the light of further investigation, I feel sure that his diagnosis was correct. I admit that I had not in the first instance examined the sputum microscopically as the case appeared to be so obvious and no aids to diagnosis were apparently required. The sputum ceased so rapidly that I was left astounded. My regret has lasted ever since, but as I say, I think this was really a case of "septic lung" not caused by the tubercle bacillus as the main factor.

In any case, whatever the real bacillary cause of the illness was the cure was performed by a single intravenous injection of 2 c.c. of iodine diluted up to 10 c.c. in distilled water.

Case 2—Nahodar, male, aged 36. Came on 5-12-1921 suffering from cough which lasted for the last three years following an attack of influenza. He had physical signs of the chronic bronchitis type with profuse moist sounds in both lungs. He stated that he got fever almost daily. He was considerably reduced in weight. The sputum was examined for tubercle bacilli none found. His sputum was profuse.

He was given 2 c.c. of solution "B."

Seen again on 12-12-1921. His cough had decreased as he said, to a half, and the sputum much diminished. Leucocyte count 14,000.

A second injection, 2 c.c. of solution "B" again given.

Patient seen again on 10-1-1922 looking a different man. His cough had practically ceased and he said it was difficult to raise any sputum except the first thing in the morning. He had no fever now and had begun to put on weight. He was not seen again.

If one or two injections of iodine can cure a chronic case of cough due to an infected lung, which has lasted for three years, the treatment is worth while trying.

Case 3—Mathur Das, aged 25, had been ill for four years with a cough, loss of weight and fever. He came to me on 14-3-1922, and was so weak that he had to be supported into the room. He looked so ill that I told his father that I had no hope of being able to do him any good at all, but to satisfy them I examined his chest. He could only recline propped up. He had signs of a cavity in the left base. Bronchophony with increased vocal resonance and moist sounds with impaired note on percussion extended to the angle of the scapula. His sputum was profuse, mucoid and purulent, not nummulated. I gave him 1 c.c. of tincture of iodine diluted up to 10 c.c. with distilled water. I was afraid of giving even that amount.

28-3-1922. Looked much better and is stronger. He could walk into the room without assistance. He said that his sputum was reduced to half the former amount. Physical signs were much the same except that there were now no moist sounds. He said that he had no fever. An injection of half grain iodine (Nesfield) was given.

11-4-1922. Had physical signs still over the left base and bronchophony. Dry crackling sounds. He has still less expectoration. No fever. Weight has increased by 3 lbs. Injection of 1 c.c. of tincture of iodine. Leucocyte count 16,000. He was later seen frequently by Sub-Assistant Surgeon Lehna Singh. He was able to walk 2 to 3 miles a day and was putting on weight. I have not heard of him since September 1922 when he was reported to be well.

For the time being, at all events, this man is vastly benefited, but it is, I think, impossible to expect that the cavity he almost certainly had, can completely collapse. The dry crackling sounds (to which allusion will be made later) to my mind show that there is a formation of fibrous tissue and probably subsequent contraction, while the actual secretion seen as sputum is diminished.

Case 4—Mr G, an American trader, aged 34, had the following history

He had influenza two years ago, but as far as he knew, recovered. He had another attack of what was called influenza in August 1923. He was laid up for 10 days but continued to have a cough. He did his work and travelled down to Ajmere from Delhi, leaving with a temperature of 102° . He went to hospital in Ajmere and was treated for bronchitis. He was there a week and was discharged much better, but his cough persisted. He returned to Delhi and gradually got worse and was treated for fever and cough. In October he suddenly developed a severe pain in the right side of the chest.

On October 15th, I was called to see him in consultation. He had had another severe attack of pain that afternoon. He was very pale, lying propped up in bed on his right side. The pain had subsided. Cough incessant. Physical signs of a pneumothorax about the middle of the scapular region. Right apex dullness. Bronchophony, some moist sounds. Left lung crepitations all over. He was emaciated and the sputum was profuse. Cough very troublesome. On account of his pneumothorax and general condition I did not care to give him an injection.

He came under my treatment on 14th November when he was admitted to hospital. He had been kept under observation for 10 days when his condition did not improve and his temperature remained raised. The sputum was still profuse. No tubercle bacilli were found.

On 15-11-1922 he was given an injection of 2 cc of solution "B". His leucocyte count on the 16th was 15,000. He felt much better, cough diminished and temperature came down. He developed a thrombosis in his vein and no subsequent intravenous injection was given.

On four occasions he coughed up small hard particles of calcified material which were probably the remains of a calcified gland. Tubercle bacilli were once found in small numbers in his sputum.

On 9th December he was put on to histogenol tablets, four daily $\frac{1}{2}$ hour before meals. He was then on the 16th started on a course of cyto-serum and hæmo-cyto-serum (intramuscular injections) and given tricalcine after meals.

His weight gradually increased from 6 st 12 lbs to 7 st 12 lbs while he was in hospital and it increased to 9 st 2 lbs before he left Delhi in March. He was fat all over. His physical signs in the lungs cleared up partly. He still had dullness at the right apex and bronchophony and diminished breath sounds over the upper part of the right lung but he had no cough or fever. The only rises of temperature he had after his iodine injection were a few sudden rises and on these occasions he got rid of more sputum. He had a slight rise of temperature when he started the intramuscular injection of cyto-serum and hæmo-cyto-serum but his improvement was maintained. If this was a case of pure tubercle the result obtained is all the more unexpected. Although tubercle bacilli were once found, I am inclined to think that they were not the predominating cause of the disease, or they would have been more numerous.

I have, therefore, included this case in the classification of "septic lung," and not among the tubercle cases, so as not to claim a case of cure for tubercle of the lung, although all his symptoms pointed to that disease. I do not wish to raise false hopes in those who may read this article.

Abdominal Tuberculosis

No cases seen sufficiently often to prove a cure, 10 cases diagnosed as such, were treated. Some showed great improvement.

Tubercle of the Lung

I began to try the effect of intravenous iodine on cases of tubercle of the lung after my success with Haider Khan in Rawalpindi Jail in September 1921.

I thought at that time that I had accidentally discovered a cure for tuberculosis, experience over the last two years has shown me the folly of jumping to conclusions.

I have divided up tubercle of the lung into three categories, following the classification of the Medical Research Committee special report 1919.

Class I Incipient tubercle.

Class II More advanced tubercle.

Class III Advanced tubercle.

A further detailed report on this disease will be published at a later date.

Class I—Incipient Tubercle

Cases treated—23

These cases are all those of patients who had clinical signs and symptoms of early tubercle of the lung though the diagnosis was not in every case confirmed by finding tubercle bacilli microscopically in the sputum.

They are the class of case which in general and consulting practice in England causes doubt and uneasiness in the mind of the doctor and anxiety to the relatives. Sanatorium treatment, voyages, great inconvenience and expense are incurred by the patient and anxiety remains. This is the class of case which does extraordinarily well on intravenous iodine.

It is impossible to say when a case of tubercle is cured. The disease is so often insidious in its onset and so gradual in its progress, that many patients suffer from tubercle of the lung without being aware of what is the matter and the doctor is often unable to arrive at a definite diagnosis. Many cases recover from tubercle and the disease is only found post-mortem, when patches of calcified tissue, scars in the lung, and hard fibrous masses tell the tale that the late patient had at one time a tuberculous focus which had healed. It is impossible to say when such a focus may again become active.

In my opinion, one can never be absolutely certain that a case of tubercle of the lung is cured. We can say that the physical signs are altered or have disappeared but we never know when activity may recommence.

I report no cures. I only report the result of this treatment which I think is worth an extensive trial on cases which can be kept under observation. The results thus given will be valuable. Those reported are so few and so little observed, that for scientific purposes, they are valueless. It is difficult to get early cases of any disease out here, and still more difficult to keep them under observation.

Case I—Ernest D, aged 11 years, has been ailing for three years and has now enlarged glands in the neck. He has harsh breath sounds over the right apex behind. He has a cough, but brings up no sputum. Losing weight.

27-1-1922 Injection 1 cc. of tincture of iodine.

6-2-1922 He looks and feels much better. He has gained $3\frac{1}{2}$ lbs in weight. The glands are smaller. The breath sounds over the right apex are clear. No cough. A second injection of 1 cc. of tincture of iodine was given. Patient was not seen again. He had come from Lahore (about 100 miles) but I should have heard if the boy had not been progressing favourably.

Case II—Ram Lall, aged 26. Fever, cough, wasting. Enlarged glands in the right supra-clavicular fossa. Right apex, breath sounds diminished. Dullness on percussion.

9-3-1922 Injected 2 cc of tincture of iodine.

16-3-1922 Air entry right apex improved. No moist sounds. Injected 2 cc of tincture of iodine.

20-4-1922 Air entry clear. No adventitious sounds. No cough. No fever. Glands are smaller. Looks much better.

Case III—The Guru Sahib has been ailing for six months with fever on and off, losing weight and looks unhealthy. Has crepitations, harsh breath sounds over upper part of right lower lobe. Has slight cough.

On 4-5-1922 injected 1 cc of tincture of iodine.

On 29-5-1922 Blood count 16,000 leucocytes. Had no rigor. Looks well. No physical signs at all. Feels

well, no cough, no fever Injected 1 c.c. tincture of iodine

Seen again in September 1922, appeared to be in perfect health Had put on weight and could take a lot of exercise without fatigue

Case II—Tara Devi, aged 22 Had been ill for three months Slight cough Temperature 99 to 100° Slight wasting Physical signs, slight crepitations at left apex above clavicle and behind on coughing

6-6-1922 Injected 2 c.c. tincture of iodine.

16-6-1922 All physical signs have cleared up Temperature normal Looks well Injected 2 c.c. tincture of iodine

All the other cases seen in this stage are to all intents and purposes the same.

Now these cases are clinically cases of early tubercle of the lung, but in none of these was the diagnosis proved by microscopical examination They are the class of case which would be regarded with the greatest suspicion by any consultant and the advice given would probably be such as to place the patient in a sanatorium for an indefinite period

These cases do exceedingly well on the intravenous injections of iodine I decline to say that any are cured as none of them have been under observation for any length of time, but the results prove without a doubt that rapid and marked improvement takes place and that is likely to be a hopeful sign of a later cure. At all events, I know of no other form of treatment which gives relief and improvement so rapidly and so consistently in these early cases of probable tuberculosis, and I can only publish these imperfect results for what they are worth

No harm ever results from using the method, so why not do so?

Tubercle of the Lung Class 2 (Second Stage)

'Moderately advanced cases—no marked impairment of function either local or constitutional Marked infiltration with no evidence of cavity formation No serious tuberculosis complications' as classified "Group 2" by the Association for the Study and Prevention of Tuberculosis in America, mentioned by the *National Health Insurance Medical Research Committee Report 1919*, p 8

Cases treated—60

Arrested—10

Much improved—16

Improved—6

Stationary—4

Worse—8

No further observation—16

Arrested as long as under observation

Case 1—Havildar Gulab Singh, aged 30, from Dera Baba Nanak, Gurdaspur district Has been ill for three years with a rise of temperature, cough, and loss of weight Left apex, dullness Moist sounds Right apex, bronchophony and dullness Right lower lobe the same

1-12-1921 Injected 2 c.c. tincture of iodine

12-12-1921 His temperature has been normal since the injection He has no cough There are no moist sounds to be heard Dullness over previous areas remains

5-1-1922 No temperature Lungs clear from adventitious sounds Feels and looks better Injected 2 c.c. tincture of iodine.

30-1-1922 Harsh breath sounds, right apex All else clear Injected 2 c.c. tincture of iodine.

11-4-1922 No physical signs in the chest. Says he has had no temperature for the last week, but has had some nasal catarrh

13-5-1922 No fever No cough Air entry right apex rather harsher than in left Weight stationary

1-9-1922 Chest clear, complains of cough, nothing in the chest to account for it. Looks well

Case 2—Fakir Mohamed, aged 22 has been ill for six months with fever and cough Has moist sounds over a large area of left base.

29-12-1921 Injected one grain of iodine (Nesfield)

5-1-1922 Has no fever or cough Fine crepitations heard over the area in left base but not so extensive as before Injected 2 c.c. tincture of iodine

19-1-1922 Still fine crackling sounds over that area

23-1-1922 Has gained 6½ lbs in weight Air entry over left base is diminished No fine crackling sounds are heard Injected 2 c.c. tincture of iodine

5-2-1922 Except for air entry over left base being diminished there are no physical signs Leucocyte count 23,000

Case 3—Mrs Radhi Kishan, aged 25 Had tubercle of the lung for eight months Sputum + in January Fever Has moist sounds and bronchophony up to the angle of the scapula on the right side No signs of cavity Wasted

31-3-1922 Injected 2 c.c. tincture of iodine

7-4-1922 Had a serious rigor Cough is very much better, only a quarter remaining Right lung, no moist sounds, over the lower part of chest behind there is a dry pleuritic rub No bronchophony Sputum still + Has much less discomfort.

15-4-1922 Air entry has increased in the right lung No moist sounds Some dry coarse friction sound Much less cough, is stronger Had some pain in right chest, probably due to adhesions or contraction of fibrous tissue Injected 1 c.c. tincture of iodine

20-4-1922 Had a rigor Not so severe as before The right lung has improved There are less dry friction sounds and air entry has increased Pain has disappeared Sputum very slight Only slight rise of temperature

23-4-1922 Leucocyte count 18,000 (This patient went up to the hills in April and died suddenly while walking)

Case 4—Wazir Begum, aged 17 years, has been ill for three months with fever Slight cough No sputum Wasting, anemia

16-4-1922 Right lung behind, physical signs of inflammation over apex and upper part of lower lobe Injected 1 c.c. tincture of iodine

26-4-1922 Had a rigor after injection Except for a slight click heard at the end of inspiration over the right apex there are no physical signs Fever and cough are said to persist Injected 1 c.c. tincture of iodine.

30-4-1922 Leucocyte count 18,000 Looks much better No cough Temperature lower

13-5-1922 No cough Temperature never above 100° Looks better

20-5-1922 Injected tincture of iodine 2 c.c Lungs are clear Still has a rise of temperature, but is getting fatter

1-9-1922 Her husband says she is quite well and has got fat

Case 5—Bibi Sherif Begum, aged 22 Ill for four years Sanatorium treatment and other tuberculosis treatment Now has a dry hacking cough Temperature normal to 99° Has slight physical signs in the right chest over apex back and front and has enlarged glands in the neck

4-5-1922 Injected 2 c.c. tincture of iodine

20-5-1922 Temperature has been between 97 and 101° Injected 2 c.c. tincture of iodine

12-9-1922 Said to be quite well by Dr Pereira Has no fever or cough

Much Improved

Case 1—Daulat Ram, aged 30 Had a cough for many years Sputum scanty Weak Loss of weight Harsh crepitations all over both lungs

19-11-1921 Injection 2 c.c. tincture of iodine.

12-12-1921 Few crepitations right back in region of scapula Injection one grain of iodine (Nesfield)

5-1-1922 Expiration wheezy and prolonged. No crepitations Looks and feels better Injection 2 c.c. tincture of iodine.

Case 2—Hukam Chand, aged 24 years Tubercle right lung, both lobes, tubercle bacilli + Has also a sinus in lower extremity right femur 7,000 leucocytes per c.mm.

23-11-1921 Injected two grains of iodine (Nesfield)
7-1-1922 Leucocyte count 10,000 Wound healing in right thigh Right lung, no adventitious sounds Has gained 4 lbs in weight

This case was sent by Dr Bal Kishan who reported in September 1922, that the patient was much better and that the sinus had healed

Case 3—Khairati Ram, aged 24, had a cough for two years Loss of voice for one year Usual physical signs right apex

19-1-1922 Injection 2 c.c. tincture of iodine

27-1-1922 Cough is better and no difference in the voice Injected 2 c.c. tincture of iodine

13-2-1922 The crepitations in the right apex have cleared up Still no difference in the voice Laryngoscopic examination—Swelling in region of the arytenoids No ulceration Vocal cords move well, white no infiltration Injected 2 c.c. tincture of iodine

Case 4—Daupti, aged 16 Brought by my head clerk Tuls Ram Had been ill for ten months with fever and cough Physical signs of disease left apex back and front Enlarged supra-clavicular glands

21-1-1922 Injected 2 c.c. tincture of iodine

30-1-1922 Had a rigor after injection No moist sounds now present Injected 2 c.c. tincture of iodine Leucocyte count 16,000

In September 1922 I heard that he was now quite well, but did not see him

Case 5—Mohamed Salim, aged 18 Had physical signs of tuberculosis left chest for one year He still gets fever Cough slight Crepitations over a large area in left lower lobe

25-1-1922 Injected 2 c.c. solution "B"

1-2-1922 The cough was worse for three days Face swelled and itched (This was one of the cases of iodism) Cough is now much less Very few crepitations heard No fever Injected 2 c.c. tincture of iodine

Case 6—Hakumat Rai, aged 43 Ill for the last three months Very wasted Cough troublesome Fever high Extensive disease left lung back and front No signs of cavity Infection evidently acute

11-4-1922 Injection 1 c.c. tincture of iodine

22-4-1922 Left lung apex clear Pleural rub lower down at base inspiratory recession fine moist sounds Cough much better, temperature 101° Injected 1 c.c. tincture of iodine

30-4-1922 Cough stopped, looks and feels better Still temperature, 101° The sounds heard are evidently pleuritic friction and resemble the rubbing together of two leathery surfaces No moist sounds

Case 7—Ghulam Fulma aged 20 years Ill for six months Slight cough Fever to 100° daily Right apex behind, moist sounds and rough harsh crepitations on inspiration after coughing

2-5-1922 Injection 2 c.c. tincture of iodine

16-5-1922 No cough, no fever, no physical signs at all getting fatter Injection 2 c.c. tincture of iodine

16-6-1922 Complains of diarrhoea Some fever and dry cough Left apex behind, slight crepitations Injection 2 c.c. tincture of iodine Put on to calcium chloride

Improved

Case 1—Fazal Mohamed, aged 12 Very emaciated, ill six months Chest, râles all over both lungs back and front Cough profuse Fever at night

6-2-1922 Injected 2 c.c. tincture of iodine

13-2-1922 All over chest dry harsh creaking No moist sounds

Injected 2 c.c. tincture of iodine

Case 2—Mrs P, aged 32 Ill for four months Fever 100° Cough + Severe pain left side of chest Diarrhoea Crepitations all over both lungs especially Wasted Looked very ill and regarded as hopeless four months pregnant.

1-12-1922 Injected 1 c.c. tincture of iodine

Cough stopped until a few days ago Temperature

No pain in left side Diarrhoea less

1-1-1923 Injected 2 c.c. tincture of iodine

16-6-1922 Great improvement except for temperature Looks much better Injected 2 c.c. tincture of iodine

14-9-1922 Said to have had fever occasionally up to three weeks ago Cough is very slight Sputum sent for examination No tubercle bacilli found Has gained in weight There is a patch of bronchophony right chest behind No moist sounds

29-5-1923 There is a patch of dullness behind over the same area Bronchophony over that area a pleuritic rub Sputum positive to T B

Case 3—Mohamed Hassan, aged 30 For six months has had fever, cough, and wasting Both apices behind and right apex in front are affected Moist sounds which extend down to the angle of scapula on right side Sputum T B found

18-9-1922 Injected 2 c.c. tincture of iodine

25-9-1922 Has much improved Cough less Temperature lower Only a few harsh sounds of pleuritic friction heard No fine moist sounds Injected 2 c.c. tincture of iodine

9-10-1922 Says that fever and cough have increased Has no moist sounds Faint click heard on inspiration about the middle of scapula on right side Loss of appetite Put on Fellow's Syrup

Stationary

Case 4—Mr McM Has been in a sanatorium for 8 months Had tubercle of the lung for one year Weight 8 st 6 lbs Put on 1 st. 2 lbs while in the hills Physical signs in right lung and left side in front

25-1-1922 Injected one grain of iodine (Nesfield)

1-2-1922 Had irregular temperature for three days after injection Cough was worse for three days then less Feels better

15-2-1922 Leucocyte count 16,000 Temperature up to 99.4 in the evenings Sputum less Physical signs are less in right lung, left side is clear Injected 2 c.c. tincture of iodine

9-4-1923 Report from Sanatorium He had lost 5 lbs in weight Cough was about the same Physical signs in the lungs less

Tubercle of the Lung Class 3 Far advanced cases

'Marked impairment of function, local and constitutional Extensive infiltration or consolidation in one or more lobes Cavity formation Serious tuberculous complications'

Cases treated—32

Improved—7

Not traced—19

Died—6

Improved cases

Case 1—Mabham Singh, aged 14 Had been ill for six months with fever, cough, loss of weight

31-10-1921 Had well marked physical signs both apices and signs of a cavity in right apex T B in sputum Injected one gram of iodine (Nesfield)

10-11-1921 Had put on 5 lbs. in weight No moist sounds in right apex Signs of cavity well marked Has rise of temperature at night still, but fever less

20-11-1921 Injected 2 c.c. tincture of iodine Has lost 1 lb in weight Few râles right apex Temperature still keeps up in the evening Looks better Is able to walk about much better.

1-1-1922 No vein for injection No change in temperature

Case 2—Mr B, aged 45, traveller, has been ill for two years and had all sorts of treatment

18-11-1921 Very emaciated T B in sputum Dry râles right lower lobe Very persistent cough Injected 2 c.c. tincture of iodine

20-11-1921 Said to be much better as regards his cough, appetite improved

19-12-1921 Says he feels much better except for the cough which is bad His temperature is lower than it was before Felt much better for the first two weeks after injection and could do his work easily Has gained 5 lbs in weight Looks better Right lower lobe, air

cle rest
0 2 cups
dyes per

Air entry is diminished, no moist sounds heard. Blood count 18,000 leucocytes. Injected 2 c.c. solution B. X-ray photo showed extensive infiltration of both lungs.

Case 3—Ram Pivari, aged 21. Been ill for 10 months. Fever 99 to 103°. Sanatorium treatment. Sputum scanty. Well covered and has not lost weight.

26-4-1922 Physical signs right lower lobe over an area 3 in by 3 in. No cavity. Has hoarseness of voice. No glands in neck. Right upper lobe in front moist sounds. Injected 2 c.c. tincture of iodine.

Went on well for 12 days with much less cough and lower temperature. Slept on the roof during a cold wind and dust storm. Had sudden chill with diarrhoea and vomiting. Temperature 103°. Cough gradually increased.

20-5-1922 Right chest full of moist sounds throat worse. Temperature 103 to 104 to 105°, weakness, loss of appetite. Injected 1 c.c. tincture of iodine.

1-6-1922 Temperature has gradually fallen to 101° and 98° lowest. Throat is better. Cough less. Feels stronger. Physical signs over smaller area. Moist sounds on coughing. Sputum +. Dullness less generally improved. Injected 1½ c.c. tincture of iodine. Put on to calcium chloride.

25-5-1923 She is doing very well. No cough has put on weight. Temperature is up to 99° most nights. Throat is better.

Case 4—Sidar Mohamed, aged 18, been ill for one year with fever, cough and wasting. Right apex behind dullness. Bronchophony, pectoriloquy. No moist sounds in cavity.

8-5-1922 Injected one gram of iodine (Nesfield).

22-5-1922—Gets only slight cough in the morning. Still has fever. Injected one gram of iodine (Nesfield).

13-6-1922 Cough better. Fever slight. General health better. Gained 4 lbs in weight. Has no moist sounds. Cavity right apex certain.

13-9-1922 Injected 2 c.c. tincture of iodine. No moist sounds. Says he has had no rise of temperature for the last month. Has much improved in general health.

Died

Case 1—Mohamed Khan aged 36. Had been ill for 3 years and in Shahpur Tuberculosis Jail.

19-12-1921 He is greatly emaciated. Sputum is profuse. Physical signs—Left upper lobe air entry diminished. Right upper lobe bronchophony. Moist sounds and rales all over chest. Temperature from 151 to 30th December, remittent.

1-1-1922 Injected 2 c.c. tincture of iodine. Left lung no moist sounds. Dry wheeze. Air entry diminished. Right lung, very bad air entry. Bronchophony at right base.

10-1-1922 Injected one gram of iodine (Nesfield). Air entry very much improved all over both lungs. Few moist sounds in left apex and few rales at right base. Sputum not decreased. Temperature is lower. Leucocyte count 18,000.

16-1-1922 Began to get diarrhoea.

20-1-1922 Is much weaker.

22-1-1922 Cough has practically ceased but he is getting weaker. Diarrhoea continues. Temperature subnormal.

28-1-1922 Very weak. Died at 2 p.m.

Post Mortem

Both lungs in an advanced stage of tuberculosis. Numerous small cavities full of caseating material. Dense masses of fibrous tissue especially at right base with dense adhesions to the pleura. Fibrous tissue formation very well marked all over lungs.

Case 2—Tota Singh aged 23. Has been ill for two years. Is very emaciated. Sputum very profuse. Physical signs, dullness in right upper lobe. Air entry very faint. Moist sounds on coughing, lower down bronchophony. Left side, air entry faint. Dry creaking sound. Temperature intermittent.

1-1-1922 Injected 2 c.c. tincture of iodine. Right lung, dry wheezy sounds, air entry faint. Left lung dry wheezy air entry with moist sounds on coughing.

10-1-1922 Physical signs much the same. Sputum less. Injected one gram of iodine. Temperature has become very irregular and intermittent.

15-1-1922 Temperature is much lower, sputum is less, began to feel pain in right arm (arm of injection).

19-1-1922 Arm is very swollen.

20-1-1922 Swelling is increasing.

27-1-1922 He has had a thrombosis, probably of the subclavian vein. The veins on the chest are dilated. He always lies on his right side. Cough has practically stopped and he can now walk for 15 minutes. Face looks better. Has put on 5 lbs in weight.

30-1-1922 Swelling in arm is less. Temperature keeping low.

1-2-1922 Left chest, moist sounds at left base below angle of scapula. Some dry harsh sounds at apex. Blood count 20,000 leucocytes.

15-2-1922 Began to have diarrhoea.

16-2-1922 Difficulty in breathing. Died at 2 p.m.

Post Mortem

Right lung—Apex cavity size of a walnut surrounded by hard fibrous mass. Whole lung disorganised but full of very dense fibrous tissue.

Left lung—Dense adhesions, large cavity at apex, about 1 pint of pus evacuated on breaking down adhesions. Whole lung a mass of tuberculous foci but was very fibrotic. Dense adhesions to chest wall.

Chronic Bronchitis

These cases include those of clinical chronic bronchitis and also some resembling tubercle in the distribution of physical signs but in whom no T.B. were found in the sputum.

These are purposely not included as tuberculosis cases.

Case 1—Abdul Aziz aged 25 has been ill for a year with fever and cough. Has crepitations in left apex behind. No T.B. found in sputum.

13-2-1922 Injected one gram of iodine (Nesfield).

20-2-1922 Cough better. No fever. Injected 2 c.c. tincture of iodine.

7-3-1922 Crepitations not heard, no fever, very slight cough. No expectoration.

11-4-1922 No physical signs, no fever, no cough. Leucocytosis 18,000.

Case 2—Gauz Mohamed aged 32. Had cough and sputum for 5 years, getting thin. Fever. Has rales in both lungs generally. Looks ill.

27-1-1922 Injected 2 c.c. solution "B".

4-2-1922 Had three days severe fever after injection. Cough less. Injected 2 c.c. tincture of iodine.

18-2-1922 No rales heard, looks much better. Very little cough. No fever. Injected 2 c.c. tincture of iodine. Leucocytosis 16,000.

Case 3—Savwan, aged 33. Has been ill for the last seven years. Became ill at Jhang Jail after three months imprisonment. Has been a year and nine months in Shahpur Tuberculosis Jail. Illness started with an attack of pneumonia left side. He is not emaciated. Sputum profuse. At left base expiration is prolonged and a few moist sounds heard at the end of inspiration. Weight 90 lbs. No fever. No T.B. found in sputum. Cocci and diplococci.

1-1-1922 Injected two grams of iodine (Nesfield).

2-1-1922 Leucocyte count 16,000.

10-1-1922 No moist sounds. The left base where moist sounds were present, has now no adventitious sounds, but less air entry. Cough and sputum much less. Injected one gram of iodine (Nesfield). Weight 94 lbs. Temperature subnormal.

22-1-1922 Sputum which formerly filled a large "gumlah" is now only a few nummulæ. Has gained 6 lbs in weight.

25-1-1922 Injected one gram of iodine. Leucocyte count 18,000. Cough is dry, a few clicks only heard at the beginning of inspiration.

1-2-1922 No moist sounds. Air entry over left base is very poor, no rales on coughing. Sputum practically nil. Leucocyte count 24,000.

14-2-1922 Except for air entry over left base being very poor, no other indications of disease Weight 107 lbs, getting fat

Case 4—Hardit Singh, aged 50 Had cough for three years Developed a temperature on 20-12-1921 General physical signs of bronchitis Weight 103 lbs

1-1-1922 Injected 2 c.c. solution "B" Had a rigor, but temperature subsequently subnormal

10-1-1922 Sputum diminished, chest clear at back Injected one gram of iodine (Nesfield)

8-2-1922 Discharged cured No sputum Weight 115 lbs

Case 5—Haider, aged 40 Says he has had cough and shortness of breath for ten years Went to jail five years ago and was sent to Shahpur Tuberculosis Jail after a month and a half at Jhelum Jail

18-12-1921 Sputum is profuse, he is not emaciated Temperature subnormal No T B found in sputum Has bronchophony and moist sounds over an area 3 in by 3 in in front left lower lobe Right lung, no adventitious sounds

1-1-1922 Left side behind from angle of scapula downwards, moist sounds, bronchophony and sputum— Injected solution "B," 2 c.c. Had rigor Temperature 102°

10-1-1922 Physical signs much the same Rales seem to be finer crackles Sputum slightly diminished Leucocyte count 16,000 Injected one gram of iodine (Nesfield) Had no rigor after second injection Has increased 10 lbs in weight

22-1-1922 Sputum has decreased to a quarter of the original amount Temperature remains subnormal

25-1-1922 Injected one gram of iodine (Nesfield) Leucocyte count 18,000 Physical signs are much the same but the air entry is better and bronchophony is less Moist crackles at the end of inspiration

1-2-1922 Left lung, sticky moist râles heard on inspiration, bronchophony only over a smaller patch, very little sputum Temperature still subnormal, gaining weight

22-2-1922 Sputum practically nil Same lot of fine crepitations both on inspiration and expiration at left base to angle of scapula Injected 2 c.c. tincture of iodine

1-3-1922 Over the area at left base instead of the fine crepitations, loud dry creaking sounds resembling the rubbing together of rough leather Bronchophony still Gained 13 lbs in weight, no sputum Leucocyte count 18,000

10-3-1922 The coarse rough sounds are still heard but are finer in quality

28-3-1922 Much the same

3-4-1922 Air entry is better Bronchophony only in patches Creaking sounds are fine and coarse in patches

17-4-1922 Air entry much improved Creaking sounds are fine on inspiration and expiration, no sputum Still gaining weight.

Injected 2 c.c. tincture of iodine on 10-5-1922

16-5-1922 No further sign of resolution

8-9-1922 General condition is about the same Has not gained any more weight Has no cough Left chest, air entry has very much improved all over the original affected area There are a few high pitched crackles, probably pleural adhesions

Pneumonia

This disease has always been a fruitful and futile source of experiment to abort the natural duration of the high temperature

The pathology of the disease consists of —

- (1) An area of infection and inflammation
- (2) A production of red hepatisation
- (3) A production of white hepatisation
- (4) Resolution

The white hepatisation is mainly leucocytic If, therefore, you can advance the stage of white hepatisation you may abort the duration of the disease

An injection of 1 c.c. of tincture of iodine, i.e., half gram of iodine is sufficient You do not want to produce a great hæmoglobinæmia but a leucocytosis

As a rule, the temperature falls within 12 hours, if it does not, you may repeat the dose the next day

If the patient appears to be in a very bad state, do not hesitate for that reason to give the injection

The first case I injected was a boy of 19 on the 5th day of the disease He had a temperature of 102°, pulse rate 124, respiration 50 He was very ill indeed and none of us had much hope of his recovery On the 6th day of disease, his temperature had fallen to 97, pulse, 84, respiration, 37 He made an uneventful recovery

In Indians, who as a rule do badly as pneumonia patients, this form of treatment can be used as a routine with probable benefit

I do not recommend a larger dose than 1 c.c. of tincture of iodine for pneumonia cases I lost one case on giving 2 c.c. and I think that very likely the hæmoglobinæmia may have been excessive

The results I have obtained confirm or are confirmed by Dr Baillie's previously recorded results, referred to below

Asthma 6 cases

These were disappointing Considering that potassium iodide is given for the relief of this disease, one had hoped for some improvement

At all events doses of one half to two grains of iodine in any preparation had no good or lasting effect Small repeated doses may do better One case who had a leucocytosis of 18,000 after the second injection was improved for three to four months

One case who was injected with 2 c.c. of solution "B" complained that he felt very tight in the chest and could not expectorate easily and felt very uncomfortable in consequence

Cases were few and it has been impossible to do any work on them

It was Major Porter's article in the *Indian Medical Gazette* which turned my attention to using iodine for treatment of lung disease

He quotes an English doctor—Dr Baillie—who two years ago had treated cases of pneumonia by this method and had obtained wonderfully good results I wrote to Major Porter and told him that I had been using this method for chronic suppuration, ulcers, etc It then occurred to me that if you can use it for an acute lung inflammation and for chronic ulcers, it might work for chronic suppuration in the lung, in other words for tubercle Nascent iodine was already used in many cases as a cure—add to this the hyper-leucocytosis obtained by intravenous injections, and the conditions for a cure appeared to be encouraging

I think that the results I have obtained are certainly encouraging and worth a more scientific trial by those who have the means of carrying them out

The cure appears to work out somewhat as follows —

Judging from carbuncles and ulcers, we find that the surface rapidly cleans and all sloughs come away, the surface becomes dry and the edges start to heal up rapidly

In the lungs there are no ulcers as such but a mass of inflamed alveoli and bronchioles all exuding mucus and pus In early cases of tubercle, we find that the crepitations clear up rapidly In cases of chronic bronchitis we find that the sputum rapidly diminishes This means that the surface, so to speak, becomes dry, just as does that of the carbuncle or ulcer The increased cough for the

first few days after injection found in some cases, probably means the clearing up of the bronchi

The next thing that happens in carbuncles is that the skin edges rapidly commence to fill in. This is really the laying down of fine fibrous tissue.

Now in tubercle the result of cure by nature is the fibrosis of the small infected area. The same thing appears to be effected more rapidly by the injection of iodine which has set up a hyper-leucocytosis, and a subsequent initial fibrosis.

This theory seems to be upheld by the fact that dry loud creaking sounds are heard in the chest of chronic bronchitis patients, some time after injection which appear to be due to adhesions in the pleura. These adhesions later on become thick fibrous tissue—no such sounds are heard at all events—and I do not suppose that the fibrosis disappears.

At the two post-mortem examinations made on two advanced cases of tubercle of the lung, I was astonished to see the enormous amount of fibrous tissue present in the lung and also the adhesions to the chest wall,—it was not like old fibrous tissue which was well organised.

However, whatever the real pathological result may be, the clinical results are to a certain extent encouraging. I have proved to my own satisfaction that (1) a general hyper-leucocytosis is produced, (2) chronic ulcers heal rapidly, (3) cases of incipient tuberculosis of the lung are at all events arrested, (4) cases of the second group of tubercle of the lung are in many cases benefited, (5) cases of chronic bronchitis are very much improved, and (6) cases of corneal ulcer are quickly cured. All these are cases of inflammation.

I admit that my cases are not scientifically complete. It has been impossible for me to work out the minimum dosage and interval, as cases have never been under constant supervision and I have had four different stations in the last three years, and consequently lost sight of my patients.

[NOTE.—At the Editor's request, the original paper has been considerably abbreviated. Many cases which were originally reported, have been omitted, and, all account of the experimental stage in the treatment, has been deleted. It is hoped, however, that nothing essential has been left out.]

A VACUUM APPARATUS FOR CATARACT EXTRACTION RECORD OF FAILURE

By R. M. DICKSON,

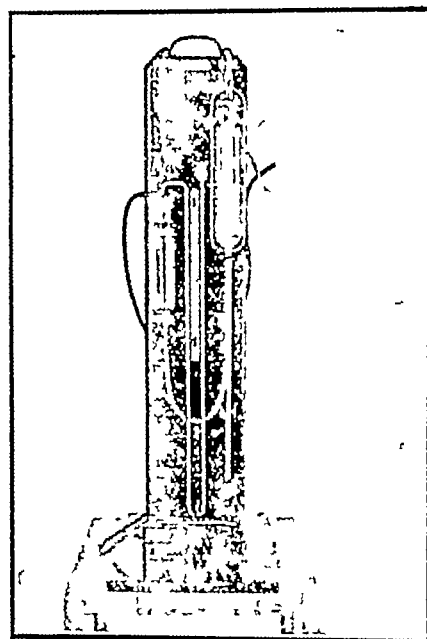
MAJOR, R.A.M.C.,

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BARRAQUER's method of operating has created such a keen interest that it has been tried with various modifications by many ophthalmic surgeons throughout the world. The principle is an attractive one, and with a wealth of material at my disposal in the Punjab, I felt compelled to give the suction method a trial.

As electricity was not available, a simple mechanical device was essential. The apparatus was suggested and made for me by Down Brothers, London, and was delivered in February last.

The vacuum was produced in a tubing system by a mercury U tube, an arrangement which was capable of very easy adjustment. The usual cup was employed to fix the lens and suction was controlled by a small lever on the handle of the instrument. The workmanship was beautifully carried out by the makers. The illustration from a photograph renders a detailed description unnecessary.



The lever was closed in the handle and the right hand container lowered on the rack to produce the vacuum and the instrument was ready for use. A case of ripe double cataract was selected, and after incision and iridectomy, the cup was carefully adjusted to the anterior capsule, and suction applied with the full power of the instrument. On attempting to make slight movement to break down the zonule, the cup immediately lost its grip. A second attempt was made with the same result, and it was obvious that the strength of the vacuum was not sufficient for the purpose. The case was a suitable one for the experiment as both lenses were immediately afterwards removed with the greatest ease by expression with the strabismus hook.

It had previously appeared doubtful whether the grip of the cup would be sufficient, as it had been tried on various types of lenses removed by expression in the capsule.

This failure is recorded as a warning to others who may contemplate using the same type of apparatus.

The mercury principle is believed to be a sound one, and the power could easily be increased by increasing the height of the column of mercury. The conclusion was arrived at, however, that the disadvantages of introducing the cup into the anterior chamber had been underestimated, and for this reason the method was discarded without further trial.

SOME NOTES ON THE TRANSMISSION OF LEPROSY

By Dr E. MUIR, M.D., F.R.C.S. (Edm.)
Calcutta School of Tropical Medicine

No definite statement can be made with regard to the method of transmission of leprosy, though it is not difficult after consideration of available facts to arrive at a moral certainty as to how the lepra bacillus enters the body.

Many attempts have been made to cultivate the lepra bacillus in vitro and to transmit it to the lower animals, but these attempts have not yet been proved successful. I mentioned the reason for this in a former article in this journal, (Oct 1921).

Further investigation has led to the belief that healthy human beings living in a healthy climate and with healthy surroundings do not develop leprosy, even when inoculated with it. This conviction has been strengthened by several cases which I have seen lately. The most striking of these was a patient who had two small anæsthetic patches and thickening of the great auricular nerve. These were all the signs of the disease that could be found, but they were sufficient to allow of the diagnosis of leprosy. He had had these same patches for 22 years during which time they had neither increased nor diminished till they had begun to increase slightly during the last two years. In this case the fact that there were three lesions to be noticed in different parts of the body implied that there had once been active leprosy during which there had been metastatic spread of lepra bacilli from the primary lesion. This active state of the disease had produced no symptoms which were sufficient to attract the attention of the patient, an intelligent European, except that he noticed the appearance of the two anæsthetic patches. The thickening of the nerve he had never noticed.

Upon examining the menial staff at the School of Tropical Medicine I found that five out of the total number of sixty or 8 per cent were suffering from leprosy, though none of them appeared to be aware of the fact. All these cases were of the nerve type of leprosy, had marked anæsthetic patches but were bacteriologically negative and therefore presumably not at that time dangerous from the point of view of the transmission of the disease.

I mentioned in the former article referred to that of 30 lepers attending the leprosy dispensary at the School of Tropical Medicine only two had entered their names in the 1921 census report as lepers, although they were all aware that they were suffering from leprosy. The two chief factors which vitiate the census returns regarding lepers are unwillingness to publish the fact that they are lepers, as in 93 per cent of the dispensary patients, and ignorance of the fact that they are lepers, as in the five menials referred to above. Between these two factors it is not difficult to come to the conclusion that 102,513, the number given as the total of lepers in India in the year 1921 census report, is necessarily very far short of the right number.

Among the public and to a certain extent among the medical profession there is an idea that pauper lepers, such as those who beg at the street corners, are chiefly responsible for the spread of leprosy, and that the ulcers which they exhibit to the public shed large numbers of bacilli which are a danger to the public. Such was evidently the idea of the framers of the Leper Act of 1898 which is still in force (in so far as any Act is in force), as the 1920 amended Act has not yet been brought into force. In the 1898 Act a leper is only counted as a leper when "a process of ulceration has commenced." Now most of the lepers, who are admitted to Gobra Leper Asylum because of ulcers, have tropic ulcers which have no lepra bacilli and are therefore presumably not a danger to the public. Indeed the majority of begging lepers beg because they have become so much deformed by nerve leprosy that they are no longer able to work. Most lepers suffering from skin (nodular) leprosy are able to go about their vocations and do not need to beg. It is such lepers who are really responsible for most of the transmission of leprosy in a city like Calcutta and even more so in the villages where pauper lepers are comparatively few. If one snips off with the scissors a small piece of skin (not necessarily nodular, only slightly swollen) the size of a small nail paring, makes a smear from it on a slide, stains and examines it under the 1/12th inch objective, every field will show thousands of lepra bacilli in many cases. When the skin of such a patient is ulcerated, or when he has a discharge from his nose, then bacilli are shed by the million, whereas the ulcers of many of the pauper lepers, supposed to be so dangerous, may be searched all day long for lepra bacilli with negative results. During the last 2½ years we have treated at the leper dispensary connected with the Calcutta School of Tropical Medicine over 500 non-pauper inhabitants of Calcutta suffering from leprosy but we do not flatter ourselves that we have attracted during that time more than a small fraction of non-pauper lepers in the

city It has been calculated that there are about 1000 begging lepers in Calcutta I think it would not be rash to calculate the non-begging lepers at twice that number

We find leprosy in three phases, the quiescent, during which the bacilli quietly multiply and spread through the lymphatics if the resistance of the tissues is insufficient to stop them, the phase of inflammation or reaction, when the lesions become swollen and erythematous and when there is often fever accompanied by other acute constitutional disturbances, and the phase of resolution, in which the lesions subside and show signs of healing in proportion to the degree of inflammatory reaction which they have passed through

The remarkable thing about leprosy is that the inflammatory phase is not a sign of rapid increase in the numbers of lepra bacilli In ordinary bacterial infections inflammation is the immediate result of a rapid increase of numbers of the bacteria In leprosy, especially in skin (nodular) lesions, the bacilli may increase in numbers to a remarkable extent without any symptoms being noticed On the other hand a comparatively small number of bacilli may cause a very marked reaction when that phase comes on

It is chiefly during the reactionary phase that ulceration of the skin and nasal mucosa takes place and that there is most danger of transmission

We have so far considered the transmission of leprosy from the point of view of the supply of lepra bacilli We shall now consider the possible modes of entrance of the bacilli into the uninfected

The facts that early lesions have never been found in the gastro-intestinal tract lower than the pharynx and that practically no lesions caused directly by the presence of lepra bacilli have been found there, and that early lesions of the mouth and pharynx are also comparatively uncommon are strongly against an oral infection

A census of lesions first noticed by lepers in leper asylums throughout India showed that in over 1,000 cases the lesions were chiefly on the extensor surfaces of the limbs, that in hilly regions a very large proportion were on the feet The largest proportion of all was on the face The scalp neck and waist were exempt and there were but few on the flexor surfaces Amongst those who wear what may be called European clothes, in which the body is less exposed to infection, lesions of the nose are found in a larger proportion than are found in those who live in hot climates and having their bodies less covered with clothing

It would appear therefore that there is a direct infection through the skin of the body and the mucous membrane of the nose Infection may take place through any breach in continuity of the epithelium which allows lepra

bacilli to enter the corium, but probably auto-inoculation by means of scratching is the commonest mode of infection As has been pointed out by Sir Leonard Rogers (*Transactions of Royal Society of Tropical Medicine and Hygiene*, 15th February 1923) the effect of a hot, moist climate is to cause increased irritation of the surface of the skin due to bites of insects, prickly heat, etc., and thus we have auto-inoculation due to scratching of the irritated parts

The promiscuous use of beds and bedding which is so prevalent in India even among the better classes, doubtless provides a very likely link in the chain of transmission The leper lies on his bed, scratches out his bacilli to soothe his irritated skin or discharges them from his ulcerated nose Some friend or other member of his family lies on the same bed The bacilli discharged by the leper stick to the exposed parts of the body, especially the cheeks, ears, shoulders and thighs, while the neck, waist and flexor surfaces remain free To complete the process it only requires the irritation of the bite of a mosquito or bed-bug or the itching of prickly heat, tinea or scabies to induce the reflex of self-scarification and auto-inoculation

While this is probably the commonest mode of transmission in India there are innumerable other ways in which similar inoculation may take place The picking of the nose so common as the result of the reflex irritation of intestinal parasites, probably indicates another common channel Public vehicles, sharp stones in those who go bare-footed and a dozen other paths of entrance readily suggest themselves Indeed, as one meditates on the subject, the wonder grows upon one that everyone living in an endemic country like India is not infected

Though absolute proof is wanting there is much presumptive evidence that, as in tuberculosis, only a comparatively small proportion of those infected ever develop the disease, or become aware that they have ever been infected Natural immunity is doubtless the cause of this Mankind, like the lower mammals, when living under healthy, hygienic, natural conditions is immune to leprosy, and it is only when the natural body resistance is weakened by other diseases or by unsuitable diet or surroundings, that the inoculated germs find a soil in the human body in which they can multiply, as is well shown in Newman's excellent work on the history of leprosy in Great Britain

Summary—The important factors in the transmission of leprosy are as follows—

(1) The type of the lesions of possible transmitters It is absurd to classify all those who have been infected with leprosy under the generic term "leper" From the point of view of transmission the line of demarcation

should lie between those in whom lepra bacilli can be found and those in whom after careful and expert search they cannot be found. Only the former are likely to be transmitters, if the lepra bacillus is the true cause of leprosy. As however a non-transmitter may at any time become a possible transmitter, examinations should be made at two or three-monthly intervals.

Voluntary segregation should be urged on all possible transmitters.

Those who can afford it should have a separate room in their house set apart for their use and all clothes, eating utensils and furniture should be kept separate. For the poor, who cannot thus isolate themselves from their families, separate accommodation should be provided by the community and the State.

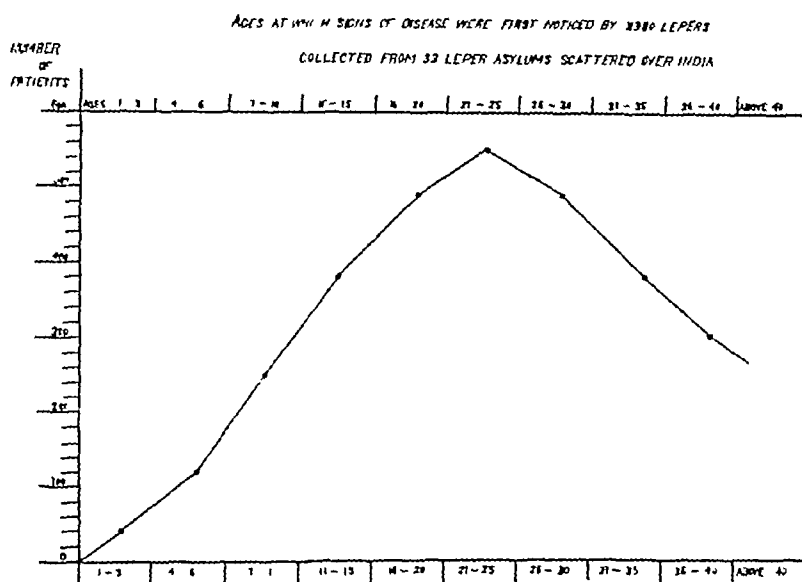
If the precaution of efficient medical examination is provided for, the non-transmitters should not be isolated nor should they be taken away from their employment. Idleness is one of the chief causes of the increase of the disease, and patients who are in fear of being certified as possible transmitters will be much

and to irritation of the skin by insects and certain skin diseases, promotes auto-inoculation.

(4) The degree of body resistance is most important and tends to be higher in temperate, healthy climates and in natural, sanitary surroundings. It is lowered by concurrent or intercurrent diseases, constipation, unsuitable diet, pregnancy and many other causes and it is commonly in connection with one of these predisposing or exciting causes that leprosy first shows itself.

What stamped leprosy out of England was improvement of sanitation, the introduction of dairy farms and market gardens and the development of individualism.

Suggestions as to the most effective method of stamping leprosy out of India—While leper colonies and hospitals may segregate several thousands of lepers at a heavy expense to the ratepayers, they cannot hope to attract many early cases or indeed many cases at all except those in the lower strata of society. If progress is to be made the problem must be tackled at the fountain head. In other words



more careful to carry out treatment with thoroughness. It must be remembered that probably the greater number of those who are infected with leprosy are non-transmitters.

I have noticed the habit which is practised in some leper asylums of mixing all types of lepers together, regardless of whether they are bacteriologically positive or negative. Much harm may result from this.

(2) We have tried to show the large number of those suffering from leprosy among all classes and that pauper lepers, the majority of whom are not transmitters, are responsible for only a small fraction of this.

(3) The habits of lepers and of those who come in contact with lepers are largely responsible for transmission, especially in house and bed infections, and a hot, moist climate, by leading to scanty protection of the skin by clothing

those who are in the early stages of the disease must be attracted and brought under treatment before they have had time to become a danger to the community. This object can only be attained by opening dispensaries in endemic areas and putting them in the charge of those who have had sufficient experience and have been specially trained for the purpose.

Such dispensaries must be placed within reach of those who should profit by them, and far advanced cases with much disfigurement should not be allowed to attend lest they should scare away the earlier cases whom it is hoped to reach.

If such dispensaries are opened in all provincial towns in which there is a high incidence, they will act not only as centres for treatment, but they will by their presence form centres of public enlightenment where local practitioners

may gain experience of diagnosis and treatment

Above all the pernicious views that leprosy is a hereditary disease and is incurable, and that its victims are under a special curse of the Almighty, will get their deathblow, and it will be realised that leprosy is a disease which is much more easy to diagnose and much easier to remedy, and therefore much less to be dreaded than the sister disease tuberculosis. When rational views prevail, patients will come forward for treatment before the disease has got beyond its first stage.

Much of the progress that has been made in recent years in combating tuberculosis has been due to the establishment of dispensaries in the centres of cities within reach of the sufferers. By means of these dispensaries treatment and instruction regarding the disease have been placed within the reach of all only a limited number being accommodated in sanatoria. Leprosy is a disease which lends itself to dispensary treatment much more than does tuberculosis. The majority of cases of tuberculosis have reached a stage at which they are a danger to the public before they are diagnosed. In leprosy most cases are diagnosed without any difficulty before they have begun to be a danger to the public. The problem of transmission can therefore be best solved by placing well-equipped and efficiently manned dispensaries within the reach of all in endemic areas.

The graph curve shows the ages at which 3,380 lepers first noticed signs of the disease. The statistics were collected for me through the kindness of Mr A D Miller from 30 leper asylums scattered all over India. The curve exactly corresponds to a similar curve of 500 leper patients attending the out-patient dispensary in Calcutta.

If the average incubation period be taken at 8 years, then the majority were infected during the first two decades of life the largest number being during adolescence. Above 40 only 389 cases or 11 per cent were noticed. The average age of the 2076 males was 35 and the average age of the 1304 females was 37.

Of the 3,380 lepers 1972 had had children 7629 in number. Of these children 6,017 were born previous to the first signs of the disease being noticed and 1,612 after. Of the 7,629 children 3,918 were dead and 3,711 are living. Only 241 or about 6 per cent of the living children have as yet shown signs of leprosy, though the statistics do not show how many of those who died were infected or how many died of leprosy.

Of all the lepers only 58 per cent remembered contact with lepers previous to their developing the disease. Of these 76 were with grandfathers, 87 with grandmothers, 438 with fathers 315 with mothers, 227 with

brothers, 93 with sisters, 26 with wives, 74 with husbands, 1,077 with other infected relations and other persons.

It is seen therefore that the majority of those who can trace the contagion are house infections, but that a certain proportion are not house infections. Conjugal infections are comparatively uncommon, only 29 per cent. Infections from parents form the largest group, showing the great necessity of separating children from infectious parents as early as possible. Where leprosy parents are in a non-infective stage, there is no need to separate the children, provided the parents are under strict and efficient medical supervision.

AN AUTOMATIC FLY PROOF LATRINE SEAT

By G G JOLLY, CIE, MB, DPH

MAJOR I.M.S.,

Assistant Director of Public Health, Burma

THE subject of fly proof latrines is one which presents the greatest interest to tropical sanitarians, and to all others connected with the conservancy of excreta. We know sufficient of the habits of the common fly to realise that his exclusion from human excreta is one of the biggest problems we have to deal with in tropical hygiene. This exclusion to be perfect must begin at the place where the excreta are voided, and continue right through to the point of final disposal. To begin with we must aim at excluding the fly from the latrine and it is with the object of effecting this, that the latrine seat described below has been devised.

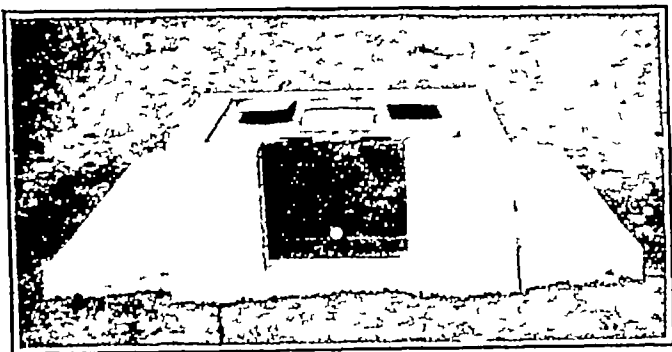
The fly proofing of latrines may be carried out either by proofing the whole structure using wire gauze over all openings such as doors windows and ventilation spaces, or by proofing the receptacle which receives the excreta. The former method is expensive, and the wire gauze requires frequent repair, both on account of natural wear and tear, and because of malicious damage. In addition the so-called fly proof doors frequently enable flies to enter, and make their exit difficult, so that in the case of such "fly proof" buildings, whether they be kitchens, markets, or latrines the arrangement acts as a trap, and the result is worse than if the building had been left freely open. For these reasons it is better to avoid wire gauze in the construction of latrines, and to rely upon reducing to the minimum the attractiveness of the structure to flies, by making the latrine shady and illuminated by a "dim religious light."

The receptacle into which excreta are passed is the part of the latrine which attracts flies. It contains the "bait" without which flies would not be more numerous in a latrine than

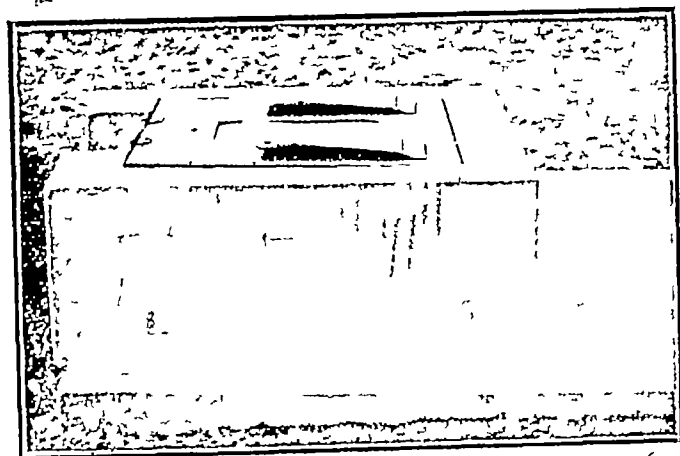
in any other building, and it is the fly proofing of this receptacle which is the really important point to aim at. The easiest way of proofing the receptacle is to enclose it in a fly proof latrine seat, which to be effective and

as to effectually exclude flies, would undoubtedly be of sanitary utility."

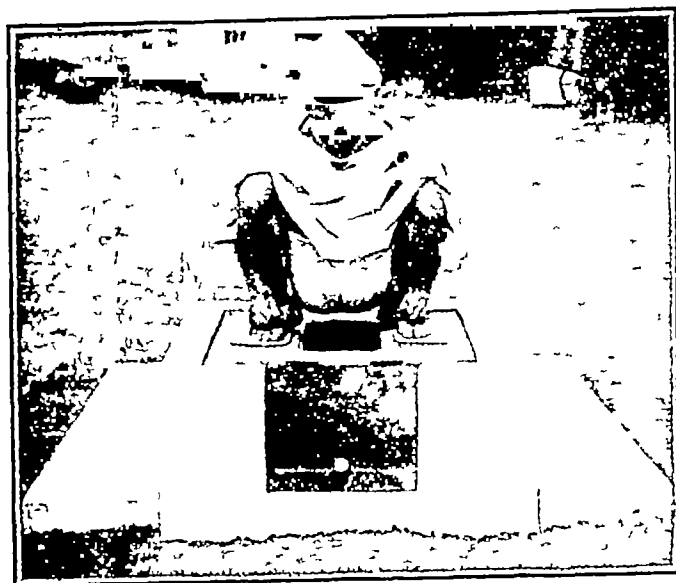
Several patterns of automatic fly proof latrine seat having this object in view have been designed from time to time. The earliest I



Front view, closed

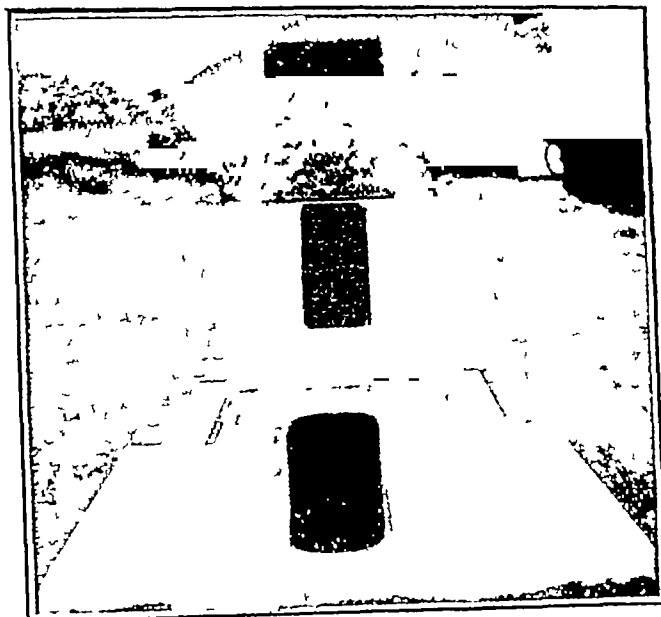


Side view, closed



Front view, in use

to comply with the caste prejudices of Indians, must be automatic in action. King, in reviewing such a seat, remarks "A latrine seat so arranged that without touching it with the hands, it shall open previous to the act of defecation, and automatically close thereafter, so



Front view, top raised

have been able to trace is one patented by Dr Chalke, a covenanted Medical Officer of the Madras Medical Service, in 1894. In Chalke's latrine seat the lid automatically opened and closed, and there was also an automatic arrangement for covering the excreta with disinfectant. Of later years Major Scroggie, I.M.S., designed a fly proof latrine seat for Indians, operated by the weight of the individual actuating two movable foot-rests, which caused pivoted shutters to move downwards and expose the receptacle for faeces.

Still later an automatic fly proof latrine seat, said to be invented by an Executive Engineer, has been marketed by Messrs Richardson & Cruddas of Bombay, in which the closing and bolting of the latrine compartment door causes the lid of the latrine seat to open, and to remain open until the door has been unfastened.

These latrine seats have certain disadvantages which detract from their utility. In Major Scroggie's pattern, a description of which was published in the *Indian Medical Gazette*, Vol 54, page 370, the main disadvantage is that the shutters forming the lid of the seat fold downwards in the act of opening, so that they are liable to become fouled by excreta. When the shutters close again faecal material adhering to them is carried to the surface of the seat, and becomes exposed to flies. The lateral slope of the foot-rests is also a disadvantage, making it awkward for the individual to get into position.

In the type in which the opening and closing of the seat lid is dependent upon the movements of the door, an opportunity is afforded

for flies to settle on the excreta and to escape again whilst the lid is open, both before the individual has mounted the seat, and after he has left it but has not yet opened the door.

It is claimed that these disadvantages have been obviated in the latrine seat which I am about to describe.

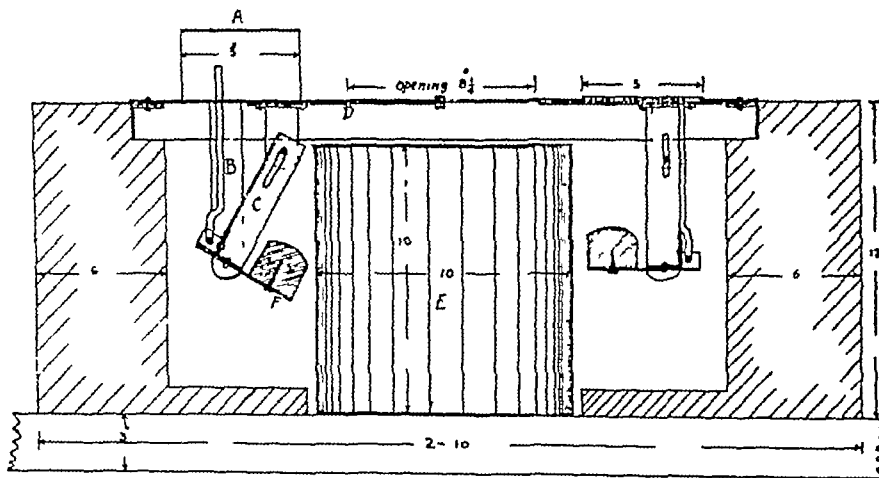
Construction of the seat—The general framework is of angle iron covered with iron sheet, in the portable form, and of concrete in the fixed type. This box, whether of iron or cement, has an iron top, with two movable foot-rests, hinged to the back end of the top, and bearing upon actuating rods, passing downwards through the tops. The central opening, when the seat is not in use, is closed by means of two horizontally placed steel shutters, which meet and slightly overlap in the central line. When the seat is in use, the weight of the person squatting on the foot-rests depresses these, making the actuating rods move downwards and, by means of a simple system of levers, causing the two shutters to slide laterally and disappear under

The general appearance of the seat is indicated in the photographs, and the detailed construction is given in the section.

There are several points which seem to call for special remark. The shutters, being arranged to slide horizontally under the right and left halves of the top, are never in such a position that they can be fouled, since they completely disappear from sight as soon as the individual steps on the seat, and remain thus until he steps off again.

2 The arrangement of the oval pan receptacle is such that its top edge comes close up to the under surface of the shutters, so that there is no possibility of excreta going anywhere than into it. The pan is ordinarily designed to take both faeces and urine, but it can be constructed in two sections so that they may be separated.

3 In the portable pattern, entirely constructed of iron and steel, the weight of the whole seat is approximately 40 lbs and han-



Cross Section of Automatic Fly Proof Latrine Seat. Foot plate A presses down rod B. Crank C then pulls shutter D and exposes receptacle E. Return action is made by weight α when foot is taken off A.

the right and left halves of the top. In this way the opening is uncovered and the faeces receptacle exposed. When the act of defecation is completed, and the individual steps off the foot-rests, the shutters are automatically moved back into the closed position, by means of two counter weights, attached to the system of levers. These weights rise when the foot-rests are depressed and the shutters are open, and fall again when pressure is removed from the foot-rests, closing the shutters in their fall, and raising the foot-rests back to their original position. The receptacle used is an oval galvanised iron pan, which is slid into position through a flap door, placed either at the front or back of the latrine seat, the door being so constructed that it cannot be left open, but automatically falls shut by virtue of its own weight.

dles are provided on either side to admit of its being readily moved from place to place.

4 In the fixed pattern the top is constructed so that it can be lifted clear of the cement base, bringing with it the whole of the working parts, a procedure which facilitates repair and renewals.

5 The working parts are simple, and so designed that they can be readily replaced or renewed by an ordinary blacksmith.

6 The only attention which the seat requires, beyond the periodical removal of the pan for emptying and cleaning, is an occasional application of cart grease to the working parts.

It is not claimed that this latrine seat will withstand the kind of use to which it is likely to be subjected in most public latrines. Nothing mechanical that I have any experience

of, has withstood for long the destructive curiosity of the unrestrained Indian public, who make short work of such things as pumps and waste-not taps, but it is expected that it will prove of considerable utility in better class private houses, and in institutions of all kinds including schools, hospitals, asylums, jails, lock-ups, factories and offices, in barracks and camps, and possibly in railway stations in fact in all situations where there is a certain amount of discipline, or where a reasonable amount of care can be taken of what is a very simple and relatively foolproof piece of mechanism

THE TREATMENT OF KALA-AZAR BY META-CHLOR-PARA-ACETYL-AMINO-PHENYL STIBIATE OF SODIUM (VON HEYDEN 471), 11 CASES

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1 *Notes on the history of the use of the aromatic compounds of antimony in the treatment of kala-azar*—The introduction of the successful treatment of kala-azar with antimony compounds occurred at the beginning of the War. The general medical and scientific world noted this important advance with considerable interest, but as it had little direct bearing on the conduct of the War, kala-azar not being a disease that is in any way associated with campaigning conditions and other forms of leishmaniasis only being of secondary importance, they very naturally took little part in furthering this advance. The introduction of a successful treatment for kala-azar was a matter of the first importance to the provinces of Assam and Bengal and the local medical community which included at that time Sir Leonard Rogers, Dr Muir, Dr Dodds-Price, Major Knowles, Dr Brahmachari and others, soon consolidated this advance. In their attempts to further this advance they were, however, very severely handicapped, from Germany they were entirely cut off, English chemists were otherwise occupied, and, probably the most important factor of all, commercial firms could not be persuaded to introduce new antimony compounds or even to put on the market antimony tartrates of a higher standard of purity than the usual commercial article. It was therefore very natural that, although slight advances were made and standards for treatment were laid down, no striking advance was made during the next five years.

By the beginning of 1920 commercial firms were beginning again to compete with one another for new markets, and several English firms were placing on the market both potassium and sodium antimony tartrates of guaranteed purity especially prepared for intraven-

ous injection. About this time German chemical firms were beginning to get into touch with the rest of the world once more. The firm of von Heyden prepared and placed on the market an aromatic compound of antimony namely sodium para-acetyl-amino-phenyl stibiate. This compound had first been used in Italy by Caronia (1916) and later by Spagnolio (1920). Their results had been promising but by no means absolutely convincing. It was tried in England by Manson-Bahr (1920) who used it in one case of kala-azar and reported favourably on it. In the same year Mackie (1921) obtained supplies of this compound from Messrs Allen and Hanbury, through whom it had been placed on the English market under the trade name of 'Stibenyl'. His results were most discouraging as also were those of other workers in India. I published the result of the treatment of 10 cases, 4 of Mackie's cases, 6 of my own, in 7 of which the treatment with 'Stibenyl' was an absolute failure. It was suggested that some change might have occurred in the hot climate in India, but a few of the cases had been treated with samples that had just arrived in India during the cold weather. I subsequently used a compound 'Stibenyl-tartrate' in 4 cases, this compound could be tolerated in comparatively large doses intramuscularly, but appeared to have no therapeutic effect whatsoever. I was therefore rather inclined to think that the aromatic compounds of antimony in which the antimony is present in the pentavalent state, were not going to be of any value, and, further, that antimony was only of value as a tartrate.

In the meantime, Brahmachari, who had been working for some time in this country on the antimony compounds, produced and tested a number of aromatic compounds of antimony, and, I understand, with some of them obtained good results, with so-called "urea-stibamine" he reported that his results were exceptionally good. He treated a number of cases with this substance in 1921 and reported the result of the treatment of 8 cases in October 1922. The notes given in this report were somewhat meagre so that, although the cases appeared to have done well, it was not clear that they had done exceptionally well, and many of those interested in the subject, including myself, were still unconvinced that any great advance had been made. As no commercial firm had been enterprising enough to take up the manufacture of this substance, as Dr Brahmachari quite naturally had difficulty in producing it in his own laboratory in large enough quantities to supply it to us for trial, and as we failed in our attempt to prepare this compound we were compelled to turn our attention to the testing of other compounds with a high chemo-therapeutic coefficient which could be more easily prepared. However at

the beginning of this year Dr Brahmachari managed to arrange to produce "urea-stibamine" on a larger scale and was able to supply it to other workers for trial Shortt (1923) in Shillong tried it in a number of cases and reported very favourably indeed Sceptics suggested that the favourable* Shillong climate had considerably aided the action of the drug, but any doubts that existed were dispelled when Dr Brahmachari read a paper at a meeting of the Medical Section of the Asiatic Society of Bengal on "urea-stibamine" in which he reported the results of the treatment of a large number of other cases with this substance. By this time a number of the hospitals in Calcutta were receiving small quantities of the substance for trial on their cases. It was now quite clear that a number of cases that had been treated with "urea-stibamine" were recovering much more rapidly and with less treatment than would have been necessary had they been treated with the antimony tartrates. There were of course some instances in which the results were not altogether favourable.

2 *Treatment with meta-chlor-para-acetyl-amino-phenyl stibiate of sodium* (von Heyden 471)—One of the compounds of antimony that I tested was sodium meta-chlor-para-acetyl-amino-phenyl stibiate. This is a compound of comparatively low toxicity and with a high parasitotropic value, its pharmacological and experimental therapeutic properties will be dealt with in another paper. The firm of von Heyden of Dresden very kindly prepared a quantity of this compound for me for trial purposes. Up to the present I have treated 11 cases with this compound, the results of the treatment of these cases is given below.

The cases were all Indian male patients in the Carmichael Hospital for Tropical Diseases. The first 10 cases had received no previous treatment and had been diagnosed as cases of kala-azar by the finding of the parasites in their spleen puncture material. The cases were not in any way selected except in the instance of the first case, the condition of most of them was distinctly worse than that of the average hospital patient.

The compound was given intravenously in solutions of 1 to 5 per cent. The dry powder

was weighed and dissolved in 10 c.c. of distilled water on the morning the injections were to be given.

Before the patient was discharged his cure was confirmed by direct examination of the spleen smear and by culture of the spleen puncture material on N N N medium in most of the cases, but in those in which the spleen was not palpable a blood culture was made.

Full details of the treatment given and the results obtained are given clearly, I hope in the accompanying temperature charts and table, it will only be necessary to give a few additional details of each case which it has not been possible to put into tabular form or to show on the temperature charts.

Case No 1—This was a Nepali boy who was chosen as the first case because, although he had been suffering from high fever for some time, his condition seemed to be fairly good. The dosage was at first very small as, this being the first case that we had treated with this compound, it was necessary to proceed slowly. The fever persisted in this case rather longer than in any of the other cases, probably on account of the fact that the dosage had been so small. His condition, however, improved in a most striking manner, before he had finished his course of injections his spleen had quite disappeared under the costal margin and his weight had increased very considerably. Two months after his discharge his weight had increased from 74½ lbs to 96½ lbs.

Case No 2—The condition of this boy was not nearly as good as that of the last, his feet and face were slightly puffy and he had a trace of albumen in his urine. He improved very rapidly and his temperature had been normal for one week when he developed a mastoid abscess. He was transferred to the Medical College Hospital where he was operated upon. On his return he was kept under observation for a few days while the result of the blood culture was awaited.

Case No 3—The condition of this case was very bad indeed, he was very weak and emaciated. He improved very rapidly under treatment, the spleen decreased in size rapidly after the first few injections and although it was still palpable it was flattened, very thin and could be replaced under the costal margin. Later the spleen was only palpable on inspiration. When the fever had been normal for nearly a week he got a typical attack of dengue, but after this his temperature again returned to normal. He lost 11 lbs in weight during treatment but was beginning to recover this before discharge.

Case No 4—An extremely weak and emaciated child whose condition was precarious from the beginning. Intramuscular injections appeared to cause momentary pain but to give rise to no inflammation or local thickening. The child had diarrhoea at the commencement of the treatment but this soon disappeared, and the general condition improved very much with the fall of the temperature after the third intravenous injection. Her condition continued to improve but four days after the last injection the child lost interest in her food, her pulse became weak and she died without the appearance of any additional symptoms.

Post mortem—There was a purpuric rash on the lower part of the abdomen.

Spleen—Not markedly enlarged, weight 3 oz. firm and fibrous.

No parasites could be found.

Liver—Rather yellow. Marked fatty degeneration. An increase in interstitial substance.

Kidneys—Pale and large. Microscopically, extensive changes. Inter-lobular infiltration by a hyaline substance. Desquamation of tubular epithelium.

Supra renals—Apparently normal, section showed no change.

* There can be very little doubt that cases improve very much more rapidly in a cooler climate than they do in the plains. Knowles's (1920) series of cases treated at Shillong were all cured by 2 grammes, an amount of antimony tartrate which would only cure about 50 per cent of cases treated in Calcutta. We find a very great difference between the rate of progress of cases treated in the hot weather and those treated in the cold weather. It seems important that the value of a compound should be judged by its action in a climate in which it will most frequently be used that is to say where the disease is acquired, in this instance in the plains of Bengal or Assam.

Heart—Flabby Signs of degeneration, breaking up of small muscle fibrils

Case No 5—This case was like No 3, weak and emaciated. He improved very rapidly, his temperature falling to normal after the third injection and his spleen, which had been very large, rapidly decreasing. He also had a typical attack of dengue. He lost 10 lbs during treatment, mainly on account of the reduction in the size of his spleen and the disappearance of a certain amount of oedema of his feet. He was gaining weight satisfactorily when he was discharged.

Case No 6—This was a moderately severe case which made a rapid and uneventful recovery. He received rather a longer course of injections than the other cases, because it was felt that the shorter course that had been given to the others might prove to be insufficient. This fear has not been justified.

Case No 7—This was a weak, anæmic and emaciated boy. He lost 8 lbs during the early part of his treatment but he recovered this loss and gained an additional 5 lbs before his discharge. He also developed a mastoid abscess after his temperature had been normal for 3 weeks, but this cleared up without surgical interference.

Case No 8—This was a very thin and anæmic child. He made a rapid and uneventful recovery. The fall in temperature would probably have been more rapid had he been given the larger intravenous injections from the beginning.

Case No 9—This case, who was admitted with a temperature of 104° , appeared to be very ill indeed. The first dose of 0.2 grammes did not cause any reaction. After the third dose his temperature fell to normal, rising again to 100° , but falling finally after the 4th injection. His spleen decreased very rapidly and he lost $2\frac{1}{2}$ lbs in weight in the first week, but in less than a month from the time of his admission, he had regained this and added another 5 lbs to his weight. This case was in hospital less than a month and is certainly the most remarkable case of the series.

Case No 10—This case had been running a febrile course but actually at the time of the first injection his temperature was normal. He had no return of fever throughout the course except that occasionally his temperature rose to 99° . His spleen decreased in size very early and after losing weight at first he put on weight rapidly afterwards. A spleen puncture after the third injection showed the presence of a few parasites but a subsequent spleen puncture and culture was "negative".

Case No 11—(A resistant case not included in the table or chart)

This was an Indian male patient aged 27 who had had 35 injections of sodium antimony tartrate, amounting to a total of 4 grammes, over a period of about 4 months without showing anything more than temporary reduction of the fever. Clinically this was an undoubted case of kala-azar, but no spleen puncture was done as the patient objected to this operation at the time. We gave him 15 injections over a period of 33 days making a total of 3.97 grammes of the compound. The temperature fell to 99° after the 8th injection and to normal after the 10th injection. His spleen which was 7 inches below the costal margin on admission was reduced to 2 inches. His weight increased from 87 lbs to $93\frac{1}{2}$ lbs after the usual preliminary loss of a few pounds, and the white blood count increased from 2,700 per c.mm to 6,000 per c.mm. Spleen puncture and culture at the conclusion of the treatment was "negative".

Dosage—The largest dose given was 0.5 grammes, which was given as the third dose to case No 10. This dose was followed by nausea and vomiting. The previous dose of 0.4 grammes did not give rise to any symptoms. The smallest dose that caused any symptoms was 0.2 grammes given to case No 2, this was given immediately after a meal and caused vomiting. Subsequent doses of 0.2 grammes given to the same patient on an empty stomach

did not cause vomiting or even nausea. It would seem fairly safe to look upon 0.4 grammes as the maximum dose for an adult (of weight 100 lbs) and to calculate the dosage for smaller adults and for children proportionately.

The initial dose of 0.2 grammes and 0.3 grammes given to cases No 9 and No 10, respectively, did not cause any reaction, febrile or otherwise. The advantages of commencing with a comparatively large dose are obvious and are well demonstrated in this series of cases. In no case did we give less than 10 injections, but it is probable that some of these cases would have been cured with a shorter course. In this series we were experimenting with the dosage. By giving a first dose of 0.2 grammes and subsequent doses of 0.3 grammes (to be on the safe side) on alternate days the course could be completed in 19 days. I think that we are justified in assuming that a course of this kind would give the best results and would cure all but 'resistant' cases.

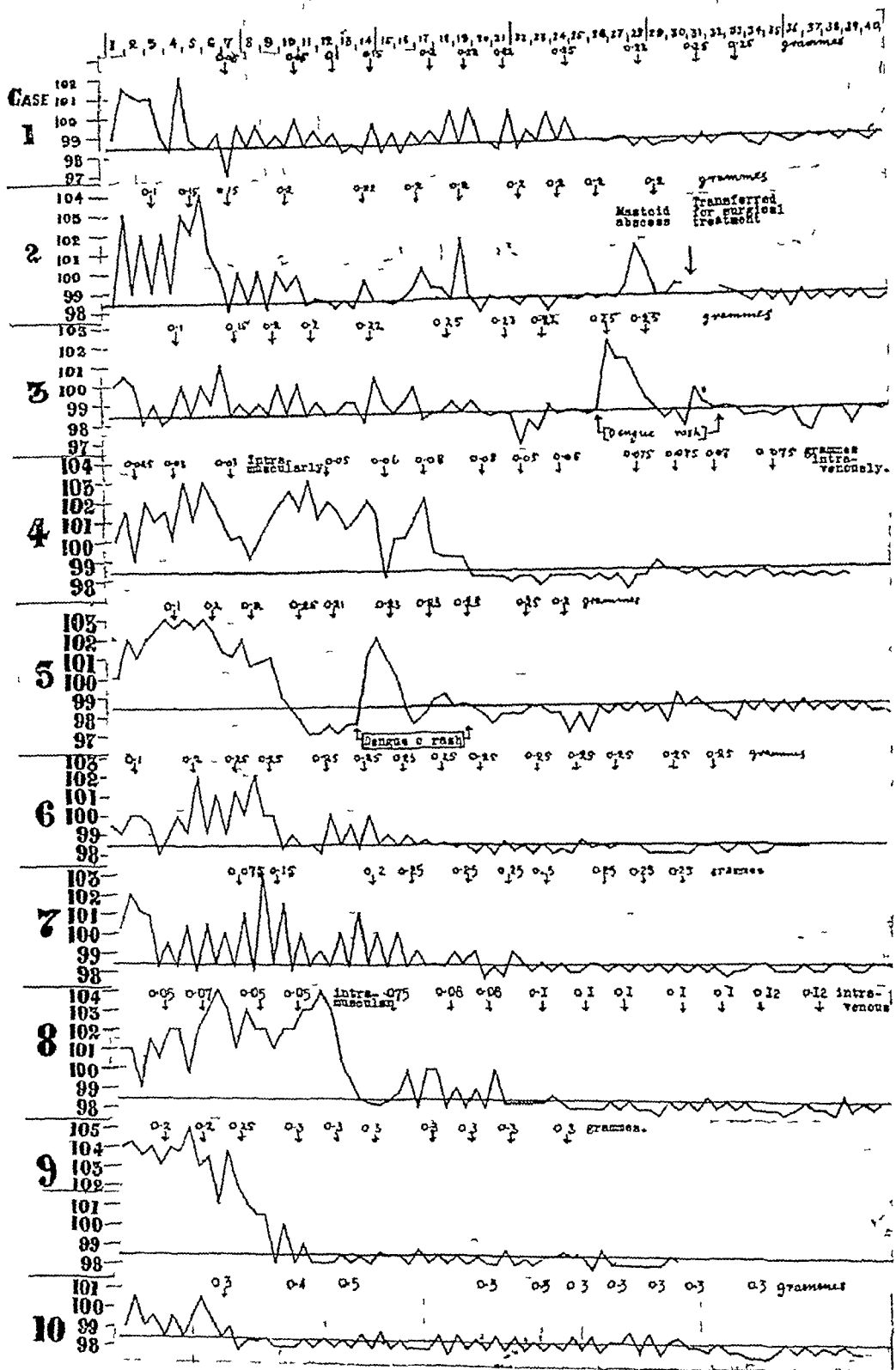
Our experience with this series of cases has done much to disprove a theory that has been put forward by various workers, including myself, namely, that the destruction of a large number of parasites at one time by the injection of a large, though sub-toxic, dose of a drug with a high parasitotropic value might liberate a large quantity of foreign protein which would give rise to a severe reaction or even to death in an extreme case.

3 *Consideration of the results*—The shortening of the time occupied by the treatment from two months, which was the minimum time occupied by the usual antimony tartrate course, to three weeks has many obvious advantages, and the reduction of the number of injections from 30 to 10 will effect a saving of labour which will more than compensate for the additional cost of the compound.

One of the most striking facts about this treatment is the rapid reduction of the temperature. In cases that are running a high temperature this is reduced almost immediately to the 100° line, and from this to the final disappearance of the fever is usually only a matter of a few days. In these cases the average number of injections to the final disappearance of the fever was 5.5, whereas in a recently analysed series of 70 cases who were treated by the usual course with antimony tartrate and were eventually completely cured, this number was 15.

Another important point is the rapid reduction of the spleen. This usually pleases the patient and should be a great help to the doctor in general practice, where pleasing the patient is half the battle.

Lung complications, from severe coughing to broncho-pneumonia, which are such a distressing and often disastrous accompaniment



Note—The amount in grammes of the compound is entered on the day on which it was given other notes have been deleted from the charts. Some the cases remained in hospital under observation after the 40th day, in none of these was there any return of fever.

of treatment with the antimony tartrates, do not seem to occur. The reason for this seems obvious. The tartrates form an acid solution. When this comes in contact with the blood a fine precipitate of oxide separates. This oxide is caught in the lung capillaries, causes the coughing, and quite possibly forms the focus which determines the broncho-pneumonia. This aromatic compound which we are using makes a neutral solution and no precipitate separates when it is mixed with the blood.

It is not possible to dogmatise on so limited an experience, but it is important to note that the improvement was uniformly rapid in every case treated. The 11 cases reported above are the only cases of kala-azar that have been treated with this compound and they all appear to have been cured with a very short course of treatment. It is true that one case died, but it is only claimed for this compound that it is a cure for visceral leishmaniasis and not that it is an elixir of life. Case No 4 was cured as far as the leishmania infection was concerned, but irreparable damage had been done already, so that the patient was unable to continue to exist. It is unlikely that the death was in any way due to the treatment as it occurred some days after the last injection had been given, and neither the symptoms nor the post mortem appearances suggested that the death was due to antimony poisoning.

4 *Conclusions*—It is clear that the treatment with this new compound is very much better than that with the antimony tartrates,

but whether it is better than that with so-called "urea-stibamine" it will not be possible to say until both substances have had a further trial. The results that I have obtained in Calcutta with this new compound compare very favourably with any of those obtained with "urea-stibamine" that have been reported up-to date including the cases treated in Shillong.

It can be claimed for meta-chlor-para-acetyl-amino-phenyl stibiate of sodium that it is a definite compound, that it will therefore not vary in its composition, that there is no great difficulty in preparing it and that it does not undergo any change in the Indian climate. We hope that we shall soon be able to add to this list of advantages, that it has been placed on the market in India at a reasonable price.

I am very much indebted to the firm of von Heyden of Dresden for the generous way in which they have supplied me with this compound for trial.

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Table showing the treatment and progress of 10 previously untreated cases of kala-azar treated by meta-chlor-para-acetyl-amino-phenyl stibiate of sodium

Case number	Age	Weight in lbs	Length of duration prior to treatment in months	Condition on admission	Total number of injections given	Total amount of compound given in grammes	Period of treatment in days	Increase or decrease in weight on discharge, in lbs	Number of injections to final disappearance of fever	Size of spleen on admission	On discharge inches below costal margin	Total white blood count on admission per cmm	Total white blood count on completion of treatment per cmm	Proof of cure	Period elapsed since last injection, months	Present condition
1	18	74½	3	Fair	11	1.96	27	+10	8	3	0	3,200	5,600	Blood culture	3	Excellent
2	14	56½	5	Poor	11	2.02	27	+11½	7	3	0	2,800	8,400	Do	3	Excellent
3	28	85½	6	Bad	10	2.06	25	-7	6	5	p	3,000	7,000	Spleen culture	3	Not known
4	3	21½	8	Very bad	3*+10	0.8	32	?	3*+3	4½	p	1,400		Clinical		Died
5	25	84½	11	Bad	10	2.12	21	-8½	3	7	p	2,000	5,900	Spleen culture	2½	Well
6	23	90½	6	Poor	14	3.3	32	+9	7	5½	1½	1,200	12,500	Do	2½	Well
7	16	73	12	Poor	10	2.12	24	+5½	6	2½	0	1,000	5,000	Blood culture	2	Well
8	5	29½	6	Poor	4*+10	1.2	34	+3	4*+3	5	1	2,300	6,100	Spleen culture	2	Well
9	20	82½	24	Poor	10	2.75	22	+5	4	6	1	4,000	7,200	Do	2	Well
10	21	103½	8	Fair	10	3.3	29	+11	1½	7	p	3,600	6,300	Do	1	Not known

* Intramuscular injections † An occasional rise to 99° p indicates palpable, but not protruding below costal arch

Indian Medical Gazette.

DECEMBER

THE FAR EASTERN ASSOCIATION OF TROPICAL MEDICINE CONGRESS

THE fifth annual congress of the Far Eastern Association of Tropical Medicine was held at Singapore from September 3rd to 17th, 1923, and was attended by Lt-Colonel S R Christophers, I.M.S., as delegate from the Government of India, Lt-Colonel E Bisset, I.M.S., as delegate from the Government of Burma, and Major A J H Russell, I.M.S., and Major J Cunningham, I.M.S., as delegates from the Government of Madras. There was an attendance of over 300 medical members representing 15 countries, and official delegates were sent by the Straits Settlements, the Federated Malay States, the Un-Federated Malay States, the Navy, the R A M C, Australia, India, Madras, British North Borneo, Burma, Ceylon, China, Cuba, Formosa, Hongkong, Indo-China, Japan, Macao, the Netherlands Indies, the Philippines, Shanghai, Sarawak, Siam, the U S A and the Rockefeller Foundation. The meetings were held in the Victoria Theatre and Memorial Hall, which were lent by the Municipality of Singapore.

The Congress was opened by His Excellency Sir Laurence Guillemard, K.C.B., K.C.M.G., who was followed by the Hon'ble Dr A L Hoops, Principal Chief Medical Officer, Straits Settlements. In his presidential address Dr Hoops took for his title "The Prevention of Disease in the Tropics" and his address constituted a most forcible and much-needed appeal for organised and international effort throughout Asia for the checking and prevention of disease. He first reviewed the origin and history of the Association which dates back to 1908. Although almost moribund after the war, the Association was revived in 1921 through the energy of the Dutch workers and members, and reorganised at the fourth Congress at Weltevreden in 1921. At that conference two important decisions were come to: first that international measures should be taken to control rice supplies in order to try and eliminate beriberi, the appointment of a commission to discuss such proposed measures being advocated; secondly, that a quarantine conference should be held at Batavia with a view to securing uniformity of action in port health procedure at the various ports of the Far East. This, however, was rendered unnecessary on the decision of the Health Committee of the League of Nations to despatch a special commission to the Far East to study the whole problems of disease incidence and

public health measures in the countries concerned. It is understood that one of the recommendations of this commission will be the establishment of a central epidemiological bureau for the Far East at some convenient station, such as Singapore. Further recommendations are that ships should be disinfected at the port of departure rather than at the port of arrival, that temporary interchange of sanitary personnel between the different governments concerned should be facilitated, and that periodic conferences of such officers, similar to that held in Brussels last year where a number of health officers from different European countries met, attended lectures by experts, and discussed programmes, should be encouraged and that the League of Nations' Health Committee might arrange for such meetings in the Far East.

Turning from this future programme Dr Hoops next dwelt upon the present insanitary state of most cities and towns in the East, and upon the immense necessity for well organised town-planning in place of haphazard methods upon malnutrition as a factor of great importance in both endemic and epidemic diseases in the Far East, upon diseases due to dietetic deficiencies, such as beriberi, scurvy and rickets. In Malaya inspection of school children has shewn that nearly two-thirds of such children in cities suffer from early dental caries owing to unskuttable diet, whereas the proportion suffering from caries in the rural schools is less than five per cent. "Our large Eastern cities need pre-natal clinics, maternity hospitals, training centres for midwives, post-natal clinics, child welfare activities, dispensaries and sanatoria for the tuberculous, venereal clinics, school and dental clinics. But what will these avail unless we remove the sources of evil—overcrowding and bad feeding? Good housing is a powerful agency in the suppression of that scourge of mankind—plague. In Assam the moving of inhabitants from infected houses to new quarters has greatly aided the diminution of kala-azar." Malaria could be rendered almost as rare in Asia as yellow fever now is in South America. The scourge of ankylostomiasis led to the organisation ten years ago of the International Health Board of the Rockefeller Foundation, which to-day covers the whole of the world with its beneficial and many-sided activities.

The principle on which preventive medicine is based should never be lost sight of. First we must have medical discovery. We must have full, clear, and rational knowledge of the causes of diseases and of their modes of spread. "It was not until the men of science took a hand that a rational scheme for the prevention of malaria everywhere and under all conditions became possible." Prior to that for centuries men had drained swamps and taken cinchona bark empirically yet there could be no

real progress without knowledge "First comes the discovery by research workers of the infective agent and of the means of its spread, then the development of methods of control" The second step consists in the application of such knowledge, the working out in detail under schemes which may require different plans of procedure in different areas and countries Most of the epidemic diseases of the East *can* be checked if only the necessary measures be taken, the diarrhoeas, the dysenteries and cholera, plague, frambœsia to mention only a few

The third essential step is an educated medical profession It is only through such a profession that the knowledge thus laboriously acquired can be brought home to the peoples concerned "The spirit of preventive medicine should animate all teaching to students" writes Sir George Newman, Chief Medical Officer to the British Ministry of Health, "and it should be illustrated in the treatment of cases It is not so much a separate subject of the curriculum that is required as a pervading influence, an attitude of mind, permeating and guiding all clinical study and practice" In fact the whole mental attitude of the medical student should be attuned to the view that his first duty is to prevent disease, his second only to treat such cases of disease as he cannot prevent We must have our corps of specialists, of medical research workers, but it is the general practitioner who is the backbone of medicine, and it is he who has got to grasp the new idea

Further, having once raised a really properly educated body of medical men in a country, the fourth essential step is the diffusion of knowledge concerning the origins and mode of prevention of spread of diseases throughout the population at large The adult is as a rule too case hardened to benefit, but the schoolboy is still impressionable Hygiene should be a subject at every school, and should be so taught, with vernacular text-books and the like, that the subject becomes interesting and is liked And in this connection the medical man who really thinks cannot afford to neglect the immense powers of the daily press for good Through the medium of the press accurate knowledge can be more widely diffused than through any other channel, and the press is never backward in aiding such work International brotherhood and co-operation are vital and it is important that the medical man shall claim his rights *Salus populi suprema* *lex* should be converted from a merely pious wish into a living reality, and the emphasis upon the word *suprema* brought into prominence The death rate in England has fallen to 13 per mille, and the infantile mortality to 77 per mille of living births (and in the families of medical men to less than 40 per mille) These results are capable of achievement in the East, as in the West

Following upon the opening day of the Congress a long and most interesting programme of lectures, meetings, and entertainments followed Papers were read by many of the leading medical men and medical research workers in the East At the farewell meeting Dr Hoops presided and came to sum up the work of the Congress The sixth Congress will be held in Tokio, probably in October 1925, and in a most graceful and charming speech Dr Miygawa whilst lamenting the recent terrible disaster in Japan, thanked the Congress for its generosity in raising funds to meet the emergency, and assured members that Japan would enjoy the honour and the responsibility of entertaining the Congress With regard to beriberi it was resolved that at present any international convention is not feasible, but that individual governments should be advised to carry out further research work into the standardisation of rice, the effects of transport and storage upon rice, and the economical aspects of the problem The exclusive use of over-milled rice should be prohibited The Association considers that educational methods of control on the basis of the available scientific knowledge should be vigorously applied in all countries With regard to quarantine the regulations of the International Convention of Paris, 1912, are not suitable to the Far East, and measures quite different from those in force in Europe are requisite It is therefore desirable that a separate agreement should be drawn up to govern quarantine regulations in the Far East to allow of the necessary co-operation between the different countries concerned The Association also resolved to ask the Health Committee of the League of Nations to arrange for the temporary interchange of sanitary personnel in countries of the Far East, and to provide for a course of instruction for health officers to be given in Tokio following the meeting of the sixth Congress

The Far Eastern Association of Tropical Medicine, as we are delighted to learn, is once again a very active and vigorous organisation Even if it does nothing more than to arouse the governments concerned from their age-long lethargy in matters of public health, its labours will be extremely fruitful A few advanced and intelligent countries, such as Czecho-Slovakia, are beginning to discover that medical men make the best statesmen, because their knowledge of life is very real and their mental outlook a genuinely wide one In general, however, the official attitude towards the doctor is that of the individualist patient he is not called in until the eleventh hour, and then his only duty is to clear up the mess The world, long centuries ago, escaped from the period when public health was under the domination of priesthoods with vested

interests to-day it seems to be passing through the transitory phase when administrative and executive power is concentrated in the hands of the legal profession, is under the control of men with quite intelligent minds but with no outlook upon life wider than that of precedent and antiquity to-morrow it may discover that the real rôle of the doctor is to prevent disease rather than to cure it, and may reluctantly surrender administrative and legal control of preventable diseases to the medical fraternity ultimately it may discover that a true philosophy is the secret of life.

A Mirror of Hospital Practice.

TWO UNUSUAL SARCOMATOUS TUMOURS

By Dr ERNEST F NEVE, M.D., F.R.C.S.E.,

Kashmir Mission Hospital

1 *An encysted ovarian sarcoma* Jani, *act* 20, a few months ago noticed an abdominal swelling in the lower part of the abdomen. This had grown quickly. It was the size of a new born infant's head. It occupied the middle of the hypogastrium, extending to above the umbilicus but also projecting into the right iliac region. There was hardly any mobility. It was hard but somewhat elastic in places. P. V. the uterus was small and mobile except at the fundus. An eight inch incision was made. The appearance of the tumour was of a dark red colour quite unlike the usual appearance of an ovarian cyst. The tumour was quite fixed and bound down and large areas of bowel were closely adherent to it. There was no pedicle. It was a solid tumour, growing between the layers of the broad ligament, both upwards above the fundus uteri and into the right flank. The mass was completely enveloped by peritoneum. This was incised and the tumour gradually shelled out. The posterior portion lay very deeply. A large number of bleeding points required ligature. There was no pedicle inside the capsule but some large vessels needed tying. The mass was then removed. An extensive cavity was left. All oozing was eventually checked and the edges of the capsule were brought forward and stitched to the abdominal wound, which was however, closed in the usual way and without drainage. The patient made an uninterrupted recovery and left hospital on the 28th day. Microscopic examination of the tumour shewed it to be a large oval-celled sarcoma. The most important points in this case were the recognition of its nature and the method of dealing with its covering.

2 *Melanotic sarcoma of the rectum* R. C., *act* 53. History of two years' duration. Symptoms those of rectal obstruction and occasional hæmorrhage. The mass was the size of a medium sized orange. It was irregular, globular but somewhat lobulated, not very vascular, with the surface ulcerated in places. After four days' preliminary treatment the patient was placed under a general anæsthetic and the anus forcibly dilated. The tumour was delivered with some difficulty. It was growing from the posterior wall of the rectum one inch above the anus. There was a pedicle of about 3 inches in circumference. The mucous membrane was incised and dissected back an inch beyond this and branches of the inferior hæmorrhoidal artery ligatured. The pedicle was then firmly tied with catgut and severed and the edges of the wound brought together over the stump. The patient, who had suffered from fever before the operation, probably due to septic absorption, had a perfectly normal temperature after the second day. On the fourth day liquid paraffin was given and followed by an enema. On the 19th day he was dismissed from the hospital in greatly improved general health. The tumour proved to be a melanotic sarcoma, the first I have ever seen or heard of in this position.

Note—Melanotic sarcoma of the anal canal has been described by Fagge. Quoted by Acton, 1922, *Indian JI of Med Research*, IX, 3, p 484—Ed, I M G

TWO FATAL CASES OF SNAKE BITE

By BELI RAM, M.D., B.S.,

Chief Medical Officer, Garhwal-Rajya, Tehri (U.P.)

Case 1—On the 1st August 1923 Gopal Datt, school master, a stout educated and intelligent man of about 25 years of age, came to the hospital at 6 a.m. stating that about three hours previously he had been bitten by a snake on the back of the left shoulder while he was sleeping soundly on the ground after a long journey on foot. When bitten the patient did not feel anything amiss except some tingling, which was thought to be due to some insect bite, until the snake was found under a box near by. Unfortunately the snake could not be caught as it went into a deep hole immediately. The snake was stated to have a hood. For about 3 hours it appears the patient had had very little signs of toxæmia. Bitten as stated at 3 a.m., he came to the hospital on foot a distance of five minutes' walk and when first seen he was complaining of pain in the chest and in the hypogastric region, had slight ptosis, complained of inability to swallow saliva and of cloudy vision. There was slight incoherence of speech. There was no paralysis of the legs or arms. The site of the bite was a small purple spot with no oozing nor any distinct swelling near it. The symptoms being those of bulbar palsy, as seen in colubrine toxæmia, 40 c.c. of antivenene (quite fresh and received only two days previously) was given intravenously in the right arm. After giving the injection he stated that his vision of the eye on the side of injection became a little clearer. The symptoms however, went on increasing and by 7 a.m. saliva began to appear, the eyelids drooped more, the head drooped and swallowing saliva was impossible. Speech became unintelligible, so the patient explained his trouble by writing on paper with a tremulous hand.

About an hour after the first dose of antivenene, a second dose of 40 c.c. of antivenene was injected, this time into a vein of the left arm.

The symptoms, however, went on increasing and by 9 a.m. the patient lay completely paralysed from head to foot but still conscious, and making signs by hand and by whispers and sometimes by facial expression.

The patient was kept fairly warm and at about 11 a.m. some sweating was noted. The pulse, however, was nearly as good as in the beginning of the toxæmia. When asked to put out his tongue he opened his jaw and tried to open his mouth and put out his tongue but could not force the tongue out beyond line of the teeth. The eyelids were closed but he could hear and understand. He was, however, now unable to make signs by hand. There was noticed no embarrassment of respiration at any stage of the toxæmia. General twitchings of the body occurred every now and then.

Having found that there was apparently nothing immediately wrong with the heart, I went to attend to another matter and half an hour later the compounder reported there was no pulse nor any sign of respiration. I returned and found the patient dead. No post-mortem examination was allowed.

Points worth noting are —

1. The pain was not marked, the patient went to sleep after the bite and ran to hospital only when the snake was seen. It appears that for three hours the poison remained locked up as it were in the tissues of the back of the shoulder around the bite and that the five minutes' walk probably threw the venom all at once into the circulation. Practically speaking his symptoms only became noticeable after his arrival at hospital.

2. Eighty c.c. of fresh Kasauli antivenene given intravenously almost immediately after the onset of symptoms of toxæmia, did not even slightly improve the symptoms. No local treatment was applied nor any other drug used.

Case 2—Lokmani, student, a boy of 12 years of age and brother to Case 1, accompanied the latter to the hospital without any complaint. (It may be stated that both the brothers were sleeping in the same bed on the ground.) Whilst I was giving the injection to the preceding case the boy appeared to be listless and complained of pain in the abdomen. He had no pain anywhere else and no mark of snake bite was found on his body. Friends of the patient said that when the snake was seen the boy said he felt some tingling behind one ear but no fang marks were found. I confess I did not examine his legs. In the beginning I thought he was frightened by the condition of his brother, so I put him to bed for observation. Eventually he felt as if intoxicated and his eyelids began to droop at about 9 a.m. and swallowing became difficult. The boy then passed through slowly ensuing symptoms of colubrine toxæmia, signs of bulbar palsy being more marked than in the case of his elder brother. The pulse remained good, respiration began to be hurried about 1 p.m. (an hour after the death of his elder brother). There was no antivenene left with me now, hence an injection of $\frac{1}{2}$ gr. calcium chloride with $\frac{1}{4}$ gr. digitalin was given. The skin was warm. His speech was not affected and he implored me not to give an injection saying his brother had died from an injection. At about 2 p.m. he swallowed a draught of tea and afterwards lost the power of speech. His consciousness remained clear however and he made signs to friends to sit round him. After 3 p.m. he began to have twitchings of body and expired at 5 p.m., 8 hours after appearance of first symptoms.

Points worth noting are —

1. The symptoms in the boy followed in the same order of sequence as in the elder brother.

2. Judging from the mildness of the early symptoms as compared with their severity in the case of the elder brother it may be supposed that the store of venom of the offending snake had been largely used up on the first patient, and judging from the late appearance of symptoms in the boy it may be supposed that the boy was bitten some time later than his elder brother.

Both the above cases were referred for opinion to the Director of the Central Research Institute, Kasauli, who has kindly written to me that Major King notes that the absence of local symptoms, the presence of abdominal pain in the cases, and the fact that paralysis did not begin in the legs are sufficient to warrant the conclusion that the snake was a krait. On receiving this note I made further enquiries from the man who had watched the snake and had played with it with a stick without killing it, and was told that he had seen many cobras but the hood in this snake was only apparent and not real as in the cobra. The above cases may therefore be taken to be the deaths from krait bite, to which Kasauli antivenene is not an antidote. Hence the failure of antivenene. Cases of krait bite are rare and therefore worthy of record.

A CASE OF FASCIOLOPSIS BUSKI INFECTION

By Dr SHIAM MANOHAR LAL,

Civil Surgeon, Bulandshahr

PATIENT G S, Hindu male, Ahir by caste, aged 30 years, was admitted to Bulandshahr District Hospital on 28-8-23 complaining of dysenteric symptoms.

Previous history—Dysentery, first a trace six months ago which lasted for 15 days and was treated by Indian village remedies. Has had three relapses since then, each lasting from 10 to 15 days. No history of having ever passed any intestinal worm. No family history of importance.

Present condition—Very anæmic with earthy pallor and debilitated. Present attack of passing blood and mucus in the stools has lasted 15 days with griping and tenesmus and increased frequency of stools. Under the microscope the stools were found to contain ova of *ankylostoma*, *trichomonas* and some trematodes resembling *Fasciolopsis buski*; no amœbæ found.

The patient was treated for ankylostomiasis by Manson's mixture of chloroform and eucalyptus oil. He passed a few ankylostome ova and hundreds of trematode worms. Those were yellowish red when passed with the anterior extremity pointed and posteriorly broad and dimpled. Each measured about $\frac{1}{4}$ inch by

$\frac{1}{2}$ inch. The margins were thin and light coloured, ventral surface concave. Oral aperture situated ventrally. These worms have a tendency to stick together and have powers of elongation and contraction. Their internal organs were not examined.

Note—The specimens were sent to the Calcutta School of Tropical Medicine for identification and were identified as *Fasciolopsis buski*. We have also received a further note upon the case from Captain K. N. Goyal, Bulandshahr—Ed. I. M. G.

A CASE OF HERNIA OBSTRUCTED BY MESENTERIC GLANDS

By C. H. REINHOLD, F.R.C.S. MC

MAJOR I.M.S.

Civil Surgeon Meerut

On the 9th of August 1923, an infant male, aet 14 months, was admitted to the Ludovic Porter Hospital, Meerut, with a large right sided inguinal hernia which was irreducible. The history showed that the hernia had existed since the child was 4 months old but had only in the past few days become larger and could not be reduced. There were no signs of strangulation, the child was breast-fed and took nourishment and the bowels were not confined.

Attempts at reduction by taxis had been made before admission and after, but without success, so an operation was decided on. The hernia was large and pear-shaped and extended to the bottom of the scrotum, and it was thought to be complicated by a hydrocele.

The usual incision was made under chloroform anæsthesia and a large very thin-walled sac came into view with dark congested bowel showing through. On opening the sac a quantity of clear straw-coloured fluid escaped, the lowest portion of the ileum, cæcum, appendix and ascending colon were recognised in the sac and there were some recent sub-peritoneal hæmatomata of the cæcum, probably the result of attempts at reduction by taxis. The bowel was deeply congested but contracted well, and there was no marked constriction at the neck or evidence of strangulation.

Attempts at reduction failed and the obstacle was found to be a mass of mesenteric glands in the angle between the large and small bowel.

An incision was made through the peritoneum and fortunately the glands shelled out easily and were found not to be caseous, the peritoneal incision was closed with a suture of fine continuous catgut and reduction of the bowel effected, but not without slightly enlarging the internal ring by a nick with the knife upwards. The sac was ligatured flush with the internal ring and cut off, and the ring constricted and the inguinal canal obliterated with a continuous blanket stitch of "thirty day" catgut, the skin incision closed and a gelatine dressing applied.

For 24 hours after operation there was considerable distention of the abdomen and evident paresis of the bowel, but a high turpentine enema given with a rubber catheter brought some relief, and $\frac{1}{2}$ grain doses of gray-powder, given every hour to eight doses, started peristalsis. On the second day he was taking the breast well and thereafter made an uninterrupted recovery, the wound healing by first intention.

I think that obstruction of a hernia at this tender age in a breast-fed child by enlarged mesenteric glands is of sufficient interest to merit recording. I am indebted to Dr. Bishamber Sahai, Medical Officer of the Ludovic Porter Hospital for his assistance at the operation and careful attention to the after-treatment.

A CASE OF INFANTILE BILIARY CIRRHOSIS

By CAPTAIN A. F. W. DA COSTA, I.M. & S., D.T.M.,
(Calcutta), A.F.M.C., Nagpur

THE patient was a Hindu male child of good family, aged thirteen months and the last child of a family of ten children, of whom one child had died in the fourth month of infancy and another of Spanish influenza in its eighth month in 1918, the rest of the family enjoying quite good health.

In April 1923 the patient, who seemed in quite good health up to that time, got fever and diarrhoea which were attributed to teething. There was some improvement in his complaint under treatment but the child was daily going downhill, losing weight as well as appetite and becoming pale in colour and thin. The temperature was of a quite irregular intermittent type, ranging between normal and 102°F . It would at times come down to normal with antipyretics but did not remain there, notwithstanding several vigorous therapeutic measures.

The patient came under my observation in June 1923 and after examining him carefully, besides his blood and urine, both of which showed no definite pathological signs, I referred the case to Dr. C. J. Fernandes, M.R.C.S. (Eng.), L.R.C.P. (Lond.), who told me that he had about a year ago another patient, a Hindu child, suffering from a similar ailment who eventually succumbed within twelve months of coming under treatment. He emphatically declared that no treatment was of any avail in improving their condition, let alone curing.

I was called in to see the child again on 10th August and I found him looking very ill and restless. The parents complained that he had fever, cough, vomiting and sleeplessness.

On inspection—Eyes puffy, complexion pale, conjunctivæ icteric, abdomen enlarged, hair dry, child emaciated, four teeth in each jaw, tonsils congested.

On palpation—Liver enlarged five finger-breadths below the costal arch, enlargement progressive Spleen enlarged

Pulse 150 per minute, temperature 101.6°, respirations 105 per minute

On percussion—Fluid in the abdomen

On auscultation—Lungs clear, heart's action rapid The child died on 15th August

This account is written with a view to elicit more information on the prevalence, causation and treatment of this disease, which seems to me to be more common than it is usually thought to be

A CASE OF AURICULAR FIBRILLATION RESTORED TO NORMAL RHYTHM

By S C BOSE, M.B., M.R.C.P. (Lond), D.T.M. (Lond),
Cardiac Research Department, Carmichael Medical
College Hospital, Calcutta

THE patient, R. S., European male, *aet* 41, consulted me on 12-8-23 for the following complaints, (i) dyspnoea on slight exertion and at night, (ii) exhaustion, (iii) palpitation, (iv) præcordial discomfort, and (v) slight cough

These symptoms commenced in March 1922, shortly after recovering from a severe attack of broncho-pneumonia in February 1922, they got progressively worse until June 1923, when he was compelled to have absolute rest He was quite unfit for any work

Family and personal history—Nothing particular to note

Past Illness—Had acute rheumatic fever at the age of 8, and it had never recurred since.

Habits—An all-round athlete, played football till 1922, regular habits

Physical examination revealed the following points—

1 Cyanosis of the lips, ears and tip of the nose with dusky skin of the face

2 Venous congestion present but slight

3 Enlargement of the heart moderate, impulse was in the 6th space 4½ inches outside the mid-sternal line

4 Valves Definite mitral stenosis as revealed by a thrill, a diastolic, and faint pre-systolic crescendo murmur at the apex

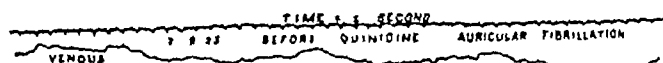
5 Rhythm Definitely auricular fibrillation, the ventricular rate was 140 per minute and grossly irregular, a polygraphic tracing was taken for the sake of completeness

6 Etiology Rheumatic.

7 Vessels Not sclerosed B P Systolic 130
diastolic 90

Urine Albumen + few hyaline and granular casts
Liver Just palpable lungs clear no oedema

Graph I.



Treatment

12-8-1923 Patient was put to bed on a restricted diet and was given 20 minims of the standard tincture of digitalis 4 times a day Constipation was relieved by a pill made up of aloes, nux vomica and blue pill every night.

20-8-1923 Patient had taken 10 drachms of tincture and yet the ventricular rate fell from 140 only to 100 he felt perfectly fit but, to expedite matters, G-strophanthin (Merck's) one five hundredth of a grain was injected intravenously and in half an hour the heart rate fell to 85, but was still irregular

21-8-1923 Next day the heart rate went up to 95, though he was still having 80 minims of the tincture a day

24-8-1923* Heart rate varied between 85 and 90 The case seemed a suitable one for quinidine treatment and the patient consented to take his chance, although he was told that only about 50 per cent. of cases of his type react to quinidine

25-8-1923 Quinidine sulphate, 0.2 gramme, was given as a test dose with no idiosyncrasy or tachycardia 80 minims of the tincture were given, making a total dose of 18 drachms of the tincture in 13 days! Yet none of the cumulative effects of digitalis were observed and the heart rate was about 85 the tachycardia of auricular fibrillation is said to yield to a total dose of 6 to 8 drachms of the tincture, but this case was very resistant

26-8-1923 Digitalis reduced to 30 minims once in the early morning Quinidine sulphate, 0.4 gramme dose, given at noon, 4 p.m., and 8 p.m. At 8-30 p.m. the heart rate rose steadily to 125 per minute and the patient was conscious of the tachycardia

27-8-1923 To guard against too excessive tachycardia, which is the physiological effect of quinidine, a big dose of 1 drachm of tincture of digitalis was given at 8 a.m. Quinidine sulphate continued, 0.4 gramme three times daily Heart rate at night was 100 p.m.

28-8-1923 On account of this fall of heart rate, digitalis was stopped altogether quinidine as before, three times daily Heart rate at night 100 p.m.

29 & 30-8-1923 Quinidine increased to 0.4 gramme, four times a day Heart rate 105 p.m.

31-8-1923 Quinidine increased to 0.6 gram every four hours from 12 noon At 8 p.m. the heart rate rose to 125 p.m. At 11 p.m. patient felt a thump in his chest which woke him up, and on feeling his pulse, he found it perfectly regular and steady At midnight, he took 0.6 gramme of quinidine, being the fourth dose for the day Altogether 6 grammes of quinidine sulphate were given in six days before normal rhythm was restored

1-9-1923 Heart rate 100 p.m. Steady and regular Quinidine 0.6 gramme three times daily no symptoms of any distress Cardiac dilation gone Apex is now four inches from mid-sternal line Pre-systolic thrill and crescendo murmur now very distinct, because the auricles are now contracting

2-9-1923 Heart rate 88 p.m. Quinidine as before

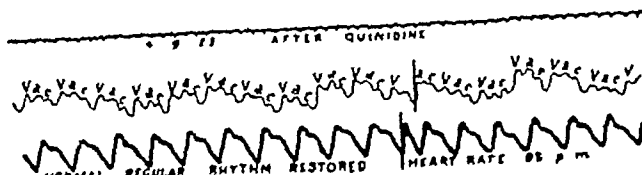
4-9-1923 Heart rate 90 regular Quinidine being very gradually reduced to 0.6 gramme twice a day The heart is almost in its normal place in the 5th left interspace, four inches from the mid-sternal line the colour of the face is bright, no venous congestion, liver not palpable Blood-pressure reading shows an improved

Systolic 150
Diastolic 90

and stronger myocardium 130/90 as compared with 130/90 before quinidine Quinidine is a cardiac

poison, not a cardiac tonic, and the patient will feel much stronger as the drug is withdrawn. Another polygraphic tracing was taken to compare it with the previous record Patient has now gone back to very light work with instructions to increase it gradually

Graph II.



1 The numerous points of interest about this case can be summarised —

1 The heart lesion presumably resulted at the age of 8, whereas symptoms of distress first appeared at the age of 40. During the last 20 years, the patient has been a footballer.

2 Onset of symptoms of distress shortly after a severe acute infection, broncho-pneumonia in this case, is typical of the early history of most cases of heart-failure.

3 The patient was unaware of the gross irregularity and extreme tachycardia.

4 At rest the ventricular rate—by auscultation—was 140 with exercise it was well over 160, which precipitates heart failure.

5 18 drachms of standard tincture of digitalis (Parke Davis & Co) and 1/500th of a gram of strophanthum were used in 13 days to bring the heart rate down to 85 this is three times the usual dose required.

6 When digitalis was stopped, the heart rate was about 100 and could not be raised by quinidine in 0.4 grammes doses four times a day.

7 The heart rate rose to 125 when quinidine was increased to 0.6 grammes every four hours.

8 Normal rhythm was restored quite suddenly, the patient being aware of it at the time.

9 A total dose of 6 grammes of quinidine sulphate was used before normal rhythm restored.

Quinidine treatment has hitherto been used in auricular fibrillation with frequent graphic records as control. In this case, no instrumental aid was required to follow the case during treatment. Lewis cautions against the routine treatment by quinidine in general practice. Having studied the quinidine treatment in a large number of cases in Lewis's clinic in 1921 to 1922 one could venture a trial in a case of auricular fibrillation away from hospital and without instrumental control. Records were taken with a polygraph to verify the findings.

11 Some of these cases again relapse into fibrillation. To guard against this adequate doses of quinidine are being continued for another six weeks.

12 The patient says he now feels twenty years younger.

A CASE OF OCULAR PARALYSIS WITH GLYCOSURIA

By J C DE,

CAPTAIN I.M.S.

Civil Surgeon Chittagong

FAIZUNNESA BIBI, a young Mahomedan woman, aged 25 was admitted into the Chittagong General Hospital on the 3rd of May 1923 complaining of severe neuralgic pains in and around the right eye.

Examination showed ptosis on the affected side, loss of all movements of the eye-ball, which was fixed in an adverted and depressed

position. The conjunctiva was slightly reddened, the cornea clear and sensitive, the anterior chamber normal, the pupil moderately dilated, and sluggishly reacting to light, the iris not congested, the tension about normal, the vision limited to perception of hand movements. Ophthalmoscopic examination showed a very anæmic fundus and a white, sharply defined disc.

The left eye was found normal in every respect. There was no affection of the nose.

The pain was severe, extended to the forehead and was considerably worse during the night.

General condition—The patient was very anæmic and had a loud hæmic murmur over the pulmonary area of the præcordium and a slight leucorrhœal discharge.

The duration had been a month, the onset gradual, with special aggravation during the week preceding admission.

Previous history—Nothing special and no history suggestive of specific infection.

The paralysis of all the ocular muscles save the external rectus and the superior oblique, the sensory disturbances, and the dimness of vision pointed to affections of the 2nd, 3rd and 5th cranial nerves (ophthalmic branch) on the particular side, which were likely to be produced by a pressure effect either inside the cranium as at the cavernous sinus, or outside in the orbit itself, as at the superior orbital fissure.

At these sites, owing to their proximity to each other, the nerves are more likely to be affected together by tumours or by inflammatory products.

The unilateral nature of the lesion supported by ophthalmoscopic findings were in favour of an extra-cranial affection and this was thought to be orbital periostitis affecting the bones entering into the formation of the superior orbital fissure.

The patient was treated with iodides and salicylates by the mouth, iron and arsenic intramuscularly and local treatment of the vaginal discharge. This line of treatment produced a slight mitigation of the symptoms but nothing more. The urine was then examined and was found loaded with sugar.

The patient was now put on dietetic treatment on the usual lines for the treatment of diabetes, and in a few days the urine became sugar free.

The pain also concurrently lessened and after a week glycosuria had completely disappeared, the vision had improved and there appeared a noticeable return in the power of movements of the eye-ball.

The patient was now feeling so very much better that she insisted on going home, promising to keep to the dietary prescribed.

The case is interesting as showing the possible ocular complications in diabetes and their

amenability to treatment of the original disease

Current Topics.

The Rockefeller Foundation.

THERE has recently been issued from the Rockefeller Foundation a review, both of its special work in 1922, and of its activities during its first decade, 1913-22, by Dr George E. Vincent, which will afford to the medical practitioner in the East matter for thoughtful reading. Some idea of the immense activities of the Foundation may be gathered from the fact that its receipts during 1922 were \$22,202,270 and its expenditure \$15,911,408. If wealth be a trusteeship for the public welfare, there can be no better example of how to utilise it than this splendid record.

The Rockefeller Foundation was incorporated on the 14th May 1913 under a special charter granted by the State of New York, and with an initial endowment of \$100,000,000, the gift of Mr John D Rockefeller. A board of trustees was appointed, and in 1919 a special Division of Medical Education was set up.

Modern medicine has been likened to a river, whose many tributaries have, during the course of centuries, flowed from all quarters of the world," writes Dr Vincent. "A mere enumeration of the names famous in the history of medicine affords striking evidence of its international character. Since 1901 the Nobel prize for contributions to medical science has been awarded to 18 men of 12 different nationalities. International co-operation in creating medical science depends upon communication of ideas from worker to worker and from country to country. The Rockefeller Foundation is helping to restore such commerce to something like normal (after the war) by the distribution of medical periodicals in Europe."

"The growth of scientific medicine during the last 50 years has radically changed the pre-requisites, subject matter, organisation, methods, equipment, duration and cost of medical education. The proprietary medical college manned and managed by a group of practising physicians has been unable to maintain itself in competition with privately endowed or publicly supported schools. The new conditions have produced the typical modern centre for teaching and investigation, the tendency in all advanced countries is towards the university type. A leading aim of the Rockefeller Foundation is to further the development of medical schools of the university type by diffusing information, training personnel, and, in important centres by making appropriations toward endowment or buildings or both." And, from Brussels to Bangkok, are listed a series of endowments, which almost stagger the imagination. "The Free University of Brussels is receiving 3½ million dollars for the construction of a modern medical school. Five millions have been given to University College and to University College Hospital Medical School, London. A million was added to the medical endowments of both McGill University, Montreal, and of the University of Toronto." The essential features of the Foundation's policy are first an enquiry by survey into the worth and usefulness, or otherwise, of the applicant medical school or college, secondly the formulation of a project, if the institution be approved, which has the complete approval of the local administrative authorities, thirdly a promise to help, on condition that other local help is forthcoming. There could be no better programme.

Of conditions in China and the recreation of the Peking Union Medical College we have recently dealt with in these columns, and here the Foundation reaches its highest and best ambitions. An interesting map shews that the facilities for modern medical training centre in Western Europe, in Japan, and in the eastern part of the United States. Many populous countries are to-day practically without medical schools. (In

India a few are shewn dotted over a bare expanse, and surely Australia is not as badly off as is shewn.)

In Central Europe and Russia the war and its sequelæ have depleted apparatus, and almost ruined many splendid medical and educational organisations. Here the Foundation has come to the rescue, both in respect of equipment, literature and personnel. The site purchased for the new School of Hygiene in London is close to both the London School of Tropical Medicine, the Wellcome Research Laboratories and University College Hospital and Medical School.

Turning to activities against individual diseases the campaign against yellow fever has been strenuously prosecuted. The disease has now been confined practically to Mexico, a restricted area of Northern Brazil, and points on the West Coast of Africa. An extraordinarily interesting map shews the comparison between yellow fever distribution in the Western Hemisphere in the decades between 1900 and 1922. "It is hard to realise that the latest phase of the fight against yellow fever only began five years ago" to-day it is almost exterminated. Of malaria, and especially of the anti-malarial campaign in the southern U.S.A., we read that "all the demonstrations have afforded cumulative proof that under normal conditions an average community can practically rid itself of malaria at a *per capita* cost of from 45 cents to \$1 per year" (Unfortunately such a sum is vastly in excess of the means of India.)

The anti-hookworm campaigns of the Rockefeller Foundation have often received attention in our columns. Here something far more than the eradication of hookworm infection in a community is sought, rather by the practical demonstration of the results achieved by modern preventative medicine, the creation of a "public health conscience" among an illiterate community. "It is an effective means of educating people in the meaning of public health work and of persuading them to support more comprehensive measures for preventing other diseases as well" (And the closest parallel to it, of which we know, is the anti-kala-azar campaign in Assam, albeit it is conducted with the most slender and straitened of means). "In 1922 the International Health Board of the Foundation had a part in hookworm control activities in 22 governmental areas in the United States, the West Indies, Central and South America and the Far East. Since 1911 the Board has co-operated in 69 states and countries. The policy of the Board has been (1) to undertake control measures only on the invitation of a government, which (2) bore from the first at least a small part of the expense, and (3) agreed to take on each year an increasing proportion of the cost until (4) it finally assumed entire responsibility for the continuance of the project."

Of the many other activities of the Foundation the creation of rural health units, consisting typically each of a health officer, a nurse, a sanitary inspector and a clerk, is an important element. A grant of \$344,440 was made to the Health Organisation of the League of Nations. During 1922 the Board provided for 237 fellowships and 23 countries were represented among the fellowship holders.

"To stimulate world-wide medical research, to aid the diffusion of knowledge, to multiply personal contacts, to encourage co-operation in medical education and public health are the means by which the Rockefeller Foundation seeks to be true to its chartered purpose, which is to promote not the exclusive prosperity of any one nation, but the well-being of mankind throughout the world." For some reason or other, unfortunately, India shares but little in the splendid and world-wide activities of the Foundation, the work in this country having hitherto been confined to a hookworm survey in the Madras Presidency and in Ceylon. Possibly, however, future years may see medical matters in this country brought into closer touch with a world-wide programme, possibly even there may be citizens, both Indian and British, in this country desirous of emulating and imitating the Rockefeller scheme, with special reference to the needs and requirements of India.

A case of Primary Extra-Genital Chancre

CAPT B SHAH I.M.S Civil Surgeon of Karwar Kamara, sends us the interesting photograph here reproduced of a case of primary syphilitic chancre on the palm of the hand of an adult male patient. The patient on careful examination showed no other



evidences of syphilis and had no secondary symptoms. His wife, as shown in the photograph, had a similar lesion on the lip. Unfortunately both cases were lost sight of before further examinations were possible.

Intravenous Iodine

ON page 561 of this issue will be found an interesting paper by Lt-Colonel W W Jeudwine I.M.S. which constitutes as far as we know the first serious contribution on a large scale basis to the study of the value of iodine when administered intravenously in different diseases. The use of this remedy is at present purely empirical. Colonel Jeudwine points out that the injections are followed by a very marked leucocytosis, and the applications of such a method are therefore obviously very wide indeed. There are many conditions where it is desirable to produce a considerable leucocytosis—*influenza* and *kala-azar* to name but two. As Colonel Jeudwine points out, this particular line of treatment is of undoubted value in both acute and chronic septic conditions in 'septic lung' cases in arthritis—possibly also in cases of phthisis which are not advanced. The chief danger and complication is thrombosis in the veins selected for injection and here the author advocates preliminary and post-injectional washing through of the vein with normal saline. The *tinctura iodi mitis* of the present British Pharmacopoeia contains 950 parts per 1000 of 90 per cent alcohol, and possibly this fact may have some connection with the few cases of thrombosis observed. Indeed we are not sure that some such preparation as the tincture of the French codex might not prove more suitable. To sum up however at the present moment, intravenous iodine therapy is becoming an interesting subject for observation and experiment although its real value or otherwise and the best methods of technique and dosage remain to be worked out.

We have received to date two further reports upon the method which we regret that the pressure upon our space prohibits us from publishing in full. One is from Sub Assistant Surgeon N KUMARA MENON Neumara Hospital Palghat. He has used the method firstly in cases of chronic arthritis. A case of what was apparently syphilitic arthritis of the knee of two years duration was very much improved after four injections and a case of chronic synovitis of different joints of many years duration showed marked improvement if not cure after three injections the dosage

employed being 5 to 15 minims of the tincture. A boy of 12 years of age with chronic arthritis of both knees and unable to walk was treated with a course of seven injections the dose being increased from $\frac{1}{2}$ to $3\frac{1}{2}$ c.c. of the tincture and left the hospital three months later walking and free from pain.

Secondly with regard to sepsis, a case of abscess in Douglas' pouch after delivery is recorded. The abscess was drained, but the fever still persisted, in spite of hydrogen peroxide and iodoform dressings. Margosis acid injections afforded no relief. Two injections of 5 and 10 minims of tincture of iodine intravenously appeared to completely cure the case. An adult male patient admitted with fever, dysentery, anaemia, and an enlarged spleen (? *kala-azar*) was apparently cured with four injections, and another case with a very much enlarged liver and spleen occupying almost the whole abdomen very much relieved. A case of gonorrhoea with bilateral buboes appeared to be cured by two injections. A first case of asthma improved after small doses, but the attacks still came on at less frequent intervals. Two other cases left hospital before results could be determined. In a fourth case of 15 years' duration an injection of half a grain of iodine intravenously gave immediate relief, and the dose was subsequently pushed to 1 and 1½ grains with benefit. A severe case of dysentery was given 8 grains intravenously in 12 days and did well whilst the method was also tried in cases of phthisis and enteric fevers. In two elderly patients severe reactionary fever was observed and the author recommends that the tincture be diluted with saline for administration.

The second report is from DR ASWANI KUMAR MITRA L.M.P. of Faridpur, who records results in 4 cases of gonorrhoeal synovitis and 5 of gonorrhoeal orchitis 4 of syphilis, 4 of carbuncle, 8 of whitlow, 20 of boils and 8 of tinea infection. His first case was one of acute gonorrhoeal synovitis, and $\frac{1}{2}$ c.c. of tincture of iodine in 5 c.c. of normal saline was given the result was that in 24 hours the patient had passed from a state of agonising pain to one of comfort. Two further injections appeared to clear the case within a week. In a case of gummatous ulceration in an elderly patient of 52 years of age all symptoms disappeared after five injections.

It is perfectly clear that, even on Colonel Jeudwine's report no very definite conclusions can as yet be come to but that there is considerable evidence of the value of the treatment in cases of chronic suppuration of whatever causation. Further experiment and tests are certainly indicated, also it is necessary to establish the special indications for this line of treatment. It will be seen that the doses advocated by Colonel Jeudwine which rise to 2 grains of iodine at an injection are considerably greater than those usually given, but that no harmful results occurred. At the Calcutta School of Tropical Medicine the treatment has recently been tried by daily intravenous injections of from 5 to 15 minims of the tincture diluted with saline, in two cases of proved *kala-azar* and in one of benign tertian malaria but with entirely negative results. In fact in the malaria case the patient's condition became so bad after the fifth injection that cinchona febrifuge in large doses had to be hurriedly administered. Rigors were still present and blood films still showed innumerable forms of *P. vivax*. (Abstracts from original communications)

Acclimatisation

DR ANDREW BALFOUR recently delivered an important lecture on this subject at St Bartholemew's Hospital London. A full report is contained in the *Lancet* of July 14th 1923.

Dr Balfour quotes Schilling as saying that Huntington showed that great climatic changes have taken place in India China and other places in consequence of which the peoples of these countries have suffered in vigour. The chief change consists in the absence of cold spells which are regarded as being of great importance in maintaining a high degree of vitality. It is

the prolonged conditions of heat and moisture that are most trying to the health. Leonard Hill points out that the maintenance of the body temperature within normal limits in the tropics imposes a harmful strain on the heat regulating centre mechanism. Aron in Manila showed that the brown skin is more suitable in the tropics than the white, it absorbs heat more readily and so leads to prompt stimulation of the sweat glands and also it gives off heat more rapidly. Balfour also points out that the white skin allows the heat rays to penetrate further into the tissues and hence they reach the blood to a greater extent than in the case of the brown skin where they are absorbed by the superficial pigment layers. Some observers have found a tendency to hyperglycæmia in Europeans in the tropics and this is believed to conduce to neuritis and to susceptibility to bacterial invasion, especially by the tubercle bacillus. Balfour points out that this hyper-glycæmia is of a different origin from that which McCay found to exist in Bengalis as a result of excessive carbohydrate in the diet.

The bulk of the evidence regarding changes in the circulatory system in the tropics points to this being due to diet rather than to climate. Balfour points to the necessity of employing the services of expert biochemists for the solution of many of the problems of metabolism in the tropics and it is obvious that here is still much need for further research into the whole question of the suitability of the tropics for the prolonged residence of Europeans.

Much fragmentary work has been done on this point, but the problem as a whole must be regarded as being unsolved.

It is generally agreed that the chief danger to life in the tropics comes from the greater prevalence of preventable diseases, but there still remain grounds for the suspicion that the highest degree of vitality and energy cannot be maintained for indefinite periods in tropical climates, especially in those in which uniform high temperatures combined with atmospheric moisture persist for the whole or the greater part of the year.

This question is of importance not merely to Europeans, it affects the indigenous populations, though possibly to a lesser extent. Altogether the lecture constitutes a valuable contribution to the subject of the reaction of the body to tropical conditions, though naturally it constitutes a summing up of the present state of our ignorance rather than a final judgment on the matters discussed.

Enquiry on Venereal Disease.

Report of Lord Trevethin's Committee

(B M J, June 9th, 1923, p 976)

THE Committee insists on the necessity of the extension of knowledge as to the nature of venereal disease and its consequences, the community should as far as possible be made to appreciate the manner of infection and the serious consequences of venereal disease.

In addition to the spread of knowledge it is necessary that measures should be pursued which will diminish those conditions of life which tend to foster promiscuous intercourse and the spread of disease.

It is established that in the laboratory, under conditions approximating to those which obtain in intercourse, disinfectants will destroy both *Spirochæta pallida* and the gonococcus, and the committee think that a man who after exposure is thoroughly and promptly disinfected by disinfectants of appropriate nature and strength runs little risk of infection. The chance of failure, however, increases rapidly as the interval between exposure and the application of disinfectants lengthens, and the conclusion seems to be that in syphilis such disinfection as mentioned above within an hour would generally be successful, and that in the case of gonorrhœa it has a prospect of success after a longer interval.

It seems, however, to be agreed on all hands that it is extremely difficult for a woman to disinfect herself, and

that the prospects of success from disinfection of another person, however skilful, are in the case of a woman less than in the case of a man.

Obviously the chances in favour of success are greater in the case of skilled disinfection than in the case of self-disinfection, but the committee see no reason to doubt that an intelligent man, if furnished with reasonable instructions, could in favourable conditions effectively disinfect himself.

Where satisfactory results were recorded from disinfection, a great difficulty arises in determining how far those results were due to the prophylactic methods employed, or were influenced by other factors in the case—such, for example, as regulation of hours of leave of absence, control of or exclusion from dangerous places, liquor control, imposition of penalties upon men becoming infected, the provision of facilities for recreation, and the moral effect in time of war of appeal for restraint on grounds of patriotism.

Where, however, satisfactory results were not recorded, discipline appears to have been defective or the control slack or the medical supervision or instruction inadequate or lacking in enthusiasm, and there is much force in the argument that in any large community a condition of control and influence affecting the life and conduct of all its members such as obtains in a military body under efficient command is essential to securing substantial results from any system of disinfection.

It must be remembered that to a large extent exposure to infection takes place in conditions in which prompt disinfection is either impossible or can only be carried out at great disadvantage. Further, the application of disinfection by a man to himself after exposure demands an effort and care which the circumstances do not tend to promote. It is urged by some that any system of disinfection would tend to increase the number of exposures and to raise the disease rate. The committee have received no evidence of facts in support of this view, and they are inclined to think that those who hold it attach too much weight to the deterrent effect of the fear of disease.

The law should be altered so as to permit properly qualified chemists to sell *ad hoc* disinfectants, provided such disinfectants are sold in a form approved, and with instructions for use approved by some competent authority. The committee suggest that the Medical Research Council should be invited to undertake this task. They think, however, that the commercial advertisement of *ad hoc* disinfectant should be prohibited.

Money spent on a general system of providing facilities for self-disinfection would certainly be less profitable than money spent either on treatment of disease or on those measures of education and improvement of social conditions to which we have referred above.

With regard to head 8 (b), the treatment of disease, they have reached the following conclusions—

(1) That, speaking generally, the general medical practitioner is not yet adequately equipped with the most advanced knowledge of venereal diseases and their treatment to enable him to deal competently with all the cases that come before him, and that an improvement in medical education in regard to venereal disease is necessary, and

(2) That the work of existing venereal disease clinics is of high value, and that the system is one which ought to be encouraged, extended, and improved.

A grave difficulty in the way of any form of notification reinforced by measures to compel treatment, is that in the present state of knowledge there is no standard of non-infectivity or cure generally accepted by the medical profession, and until this has been attained it is difficult to see how any system involving notification and compulsory measures of treatment could be applied.

As it is agreed that it is essential for the prevention of disease that there should be widespread knowledge among the community of the nature and consequences of these diseases, it follows that the importance of giving repeated personal instruction and warning to patients attending the clinics cannot be overstated. The committee think that this duty must always devolve mainly on the

doctors, but that it might well be supplemented by trained social workers, who for this purpose and that of giving general advice and assistance should be attached to the staff of the clinic.

It has been shown that if syphilis is detected in the pregnant woman, treatment during pregnancy is remarkably successful in securing healthy offspring, and gonorrhœal infection of the infant at birth may generally be prevented if the danger is known. Increased facilities for medical supervision of women during pregnancy are desirable, and may in part be obtained by an extension of the system of antenatal clinics, and by the instruction of midwives, who would refer suspicious cases to a doctor. In this connection the committee also call attention to the importance of including instruction on venereal diseases in the general training of midwives and nurses.

They think that properly and promptly applied disinfection in the case of an individual man would almost certainly prove effectual, but that so far as the community at large is concerned no sufficient case has been made to justify the introduction at the public expense of a general system of facilities either for self-disinfection or skilled disinfection, and wherever there is a limited amount of public money available, they have no doubt that money spent on (a) Treatment of disease, (b) Continuous education of the community in regard to the nature and dangers of venereal disease and the importance of seeking prompt and skilled treatment, and (c) The elimination of those conditions of life which tend to foster promiscuous intercourse and the spread of disease will be money better spent than any money expended on establishing a general system for affording facilities for disinfection.

It is right to add that so far as conclusions can be drawn from the available figures of attendances at clinics venereal disease is once more as it was before the war substantially declining.

In this Report the committee have directed their attention exclusively to syphilis and gonorrhœa. Soft chancre is a purely local affection and does not exercise any sensible influence on public health.

On Predicting the Seasonal Prevalence of an Insect

In the number for the 15th February, 1923, of the *Transactions of the Royal Society of Tropical Medicine and Hygiene* Vol XVI No 8, p 465, Dr P A Buxton, Medical Entomologist to the Government of Palestine, records a most ingenious method of possibly predicting the seasonal prevalence of any insect concerned with the spreading of diseases. A small epidemic of plague having broken out at Jaffa he went to Bacot's recorded data on the atmospheric temperature and humidity conditions for the prevalence or absence of *Xenopsylla cheopis* larvæ. By plotting on squared paper, with axes to represent humidity and temperature, black circles representing 50 per cent survivals of larvæ, black squares representing survivals of less than 50 per cent of larvæ and crosses representing 100 per cent or so mortality of larvæ, he obtained an almost circular area within whose temperature and humidity limits the larvæ will flourish whilst outside them they will die.

Plotting on the same graph the atmospheric temperatures and humidity for Jaffa at different months of the year he shows that this area and that of prevalence of the larvæ only coincide during the months of May to September during which accordingly, plague might be expected to spread whilst during the other months it should be in abeyance.

The method is ingenious and is obviously capable of further adaptations. Even if some third factor be involved it could still be introduced into the graph by plotting for three dimensions along the perpendiculars of an equilateral triangle in the manner used by engineers. The graphic value of such charts is obvious and the method is one which might be further studied.

Complement fixation in Leprosy

In the *Philippine Journal of Science* for April 1923, Vol 22, No 4, p 425, Dr E W Goodpasture records the results of complement fixation tests in leprosy with different antigens. The Wassermann reaction was positive in 60 per cent of untreated cases of nodular and mixed leprosy, and in 84 per cent of similar cases treated with chaulmoogra oil and its products for a few months but still bacteriologically positive. In 16 similar cases that had become clinically and bacteriologically negative under chaulmoogra oil treatment the Wassermann reaction was uniformly negative.

Using an antigen composed of a suspension of human *B. tuberculosis* 100 per cent of positive complement fixation results were obtained in 24 cases of nodular, mixed and anæsthetic leprosy. In 24 cases of nodular and mixed leprosy, clinically or bacteriologically negative after treatment, 2 were negative, 3 positive, 1 strongly positive and 14 weakly negative to the same *B. tuberculosis* antigen. The author concludes that complement fixation tests with bacterial antigen promise to be of service as a means of measuring the response of leprosy patients to treatment.

The Lister Ward in the Royal Infirmary of Glasgow.

SCOTSMEN are usually credited with a special sense of reverence for the past. It would appear, however, that in Glasgow at least there are vandals about. The Lister Ward stands in the forecourt of the Glasgow Royal Infirmary and has hitherto been a treasured and sacred spot. In it Lord Lister first introduced into surgery the use of antiseptics and here and in Pasteur's small laboratory at the Rue d'Ulm, was born modern aseptic surgery with all its subsequent and beneficial developments.

The Managers of the Royal Infirmary, however, now propose to pull down this treasured relic of the master craftsman and in a small but well-written pamphlet Mr James A Morris, Associate of the Royal Scottish Academy and Fellow of the Royal Institute of British Architects, pleads vigorously for its retention*. He controverts one by one the reasons advanced for the destruction of the ward, that it is septic, which is far from proved whilst in any case it is not now used for surgical work that it would interfere with light and air that it spoils the symmetry of the buildings, all of which he denies. He pleads instead that the ward be retained as a Lister Museum wherein should be collected relics of the great surgeon which would teach the medical man of to-day how great was the miracle which he wrought with such inadequate resources.

The British are a curious race. Sir Ronald Ross makes his epoch-making discovery of the mosquito transmission of malaria, and not even a tablet is placed in the walls of the tiny laboratory where he worked in Calcutta. Lord Lister creates modern surgery in a tiny surgical ward, and the Managers of the Glasgow Infirmary want to pull it down. On the other hand the Maidan of Calcutta is marred by many statues of lesser statesmen and the streets of London are rendered hideous by many statues of Victorian politicians in trousers and frock coats. Mr Morris shows how little structural alteration will be required to save the Lister Ward and to convert it into a Lister Museum for the instruction and the benefit of generations of medical students yet to come. Lord Haig and Lord Blythwood join with him and the *Glasgow Herald* also strongly supports his plea for retention. We call upon every surgeon with any reverence for the great and heroic spirit of Lord Lister, as well as upon every medical man from Glasgow University to demand that the Lister Ward shall be retained and be preserved as a National Memorial.

*A Humble Plea for the Retention of the Famous Lister Ward in the Royal Infirmary of Glasgow. By James A Morris, Associate of the Royal Scottish Academy, Glasgow. Maclehose, Jackson & Co 1923, 18 pp with 2 plans. Price 6d.

Reviews.

LECTURE NOTES IN MEDICAL PROTOZOOLOGY.—By Major R. KNOWLES, I.M.S., Protozoologist, Calcutta School of Tropical Medicine. Obtainable from Messrs. Thacker, Spink & Co., Calcutta. 1923, 236 pp. Price Rs. 6 8 including postage.

THE majority of the important diseases which a medical man has to treat in a tropical country are caused by protozoa and yet there is no text-book on medical protozoology. In order to acquire any knowledge of the rudiments of protozoology and the place of the various parasitic protozoa of man in the general scheme of the protozoa it has been necessary for the "student" to dive into many large text-books on general protozoology, into others on tropical medicine and as a reward to gain a very confused, if not inaccurate, idea of the whole subject. The consequence of this has been that most of us have had to learn our protozoology backwards. During the last few years Dobell and O'Connor have systematised the intestinal protozoa for us, but this constitutes only one branch of the subject.

The present volume is not the missing text-book, but it is the next best thing, it is a collection of the notes which could, and we hope will, form a basis for such a text-book. As the author explains the primary objects of this book were to place in the hands of his students his lecture notes in readable form and to found the fortunes of a book fund which will finance his more ambitious project (i.e., a text-book of medical protozoology). The whole cost of the production of this volume has been generously borne by Sir R. N. Mukerjee and Mr. Ganshyam Das Birla, the whole of the proceeds from its sale will be devoted to the book fund of the Calcutta School of Tropical Medicine.

After the opening chapter on general principles the author has dealt systematically with the various species that are associated with man grouped in the four main protozoological sub-phyla, namely, Sarcodina, Mastigophora, Sporozoa and Ciliophora, and has ended with three chapters, or rather lectures, on those "nobody's children" the spirochaetes and one of the problematic chlamydozoa.

Each of the human protozoa is described separately as to its position in protozoological classification, its usual environment, its morphology staining characteristics and differential diagnosis, its method of re-production and the pathological conditions with which its presence is usually associated. Detailed notes on the technique in the methods of recovering and identifying the organism are given in each lecture which is concluded in every case with a full bibliography.

In dealing with a subject of this nature it is almost impossible to avoid controversial points, but wherever the views of accepted authorities do not coincide both theories have usually been detailed with a few exceptions, such as in his treatment of the chlamydozoa, his opinions may be said to be comparatively orthodox.

The bibliography at the end of each chapter contains in all over three hundred references, this does not include any references for the trypanosomes the bibliography of which the author explains is too enormous to be attempted.

This excellent book goes far to supply a long-felt want, that it does not go the whole way is not the fault of the author. A copy should be in the hands of every post-graduate student in the tropics. The whole of medical protozoology is presented in an easily assimilable form and at the same time the position in general protozoological classification of the various protozoa of medical interest is clearly explained.

There are many points about this book which one could criticise, as for example the précis method of

writing which is very irritating to read, the absence of an index or of even a list of lecture headings and so forth, but these faults were all committed in the interests of economy and were probably quite as obvious to the author as they are to us.

OFFICIAL HISTORY OF THE WAR MEDICAL SERVICES: HYGIENE OF THE WAR. Vols. I and II—Edited by Major-General Sir W. G. MACPHERSON, Col. Sir W. H. HORROCKS, and Major-General W. W. O. BEVERIDGE, London. H. M. Stationery Office, 1923. Price, 21s. each, Vol. I—pp. 400, Vol. II—pp. 506. Obtainable from Messrs. Thacker, Spink & Co., Calcutta and all agents for Government publications.

WE have already noticed in these columns the volumes devoted to the surgery and medicine of the war. The war was largely a struggle in the preservation of morale. Constantly varying conditions had to be considered, provided for, and the necessary adaptations made. Early prodigality had later to be replaced by scientific sufficiency, and efficiency had to be attempted with makeshift contrivances. A small but highly trained and competent army, having done its work, was replaced by a large mass of new soldiers who, though young, eager and willing, were untrained. But in these circumstances we can find the reason for the success which rewarded the efforts of the sanitary personnel of the British army. The first army, from the highest to the lowest rank, had been well trained in sanitary science. All had appreciated and had accepted the importance of military hygiene, not only the trained personnel, but every officer and man of the original expeditionary force. There was therefore ready the framework for building up the sanitary structure of the new army. And the sanitary sense was not wanting in the new soldier. Already in civil life he had learned the benefits and comforts of good sanitation and though new conditions and surroundings left him somewhat at a loss, he was receptive and responsive to the teaching of those who knew, and soon the new was as good as the old.

These volumes are of extreme interest. To the military medical officer they will of course be indispensable, but for the civilian medical officer in India where conditions sometimes resemble those "behind the front line" they will also be of great value. In reading the volumes one admires the prescience and the organizing abilities of those responsible for the soldier's hygienic welfare. They were quick to realise the importance of new factors and problems, able and willing to enlist the help of those who could most quickly point the solution and quick again to see that these methods were put into practice where applicable, and in the records under review full credit is given where it is due.

The various chapters deal with the different aspects of military hygiene and each chapter is written by an expert, who, in addition to his own experience, has been able to draw on all official documents relating to his subject. It is impossible to treat each subject in detail and we can only indicate the most salient features.

A short but excellent preface by Major-General Macpherson, epitomises the scope and purpose of the books.

The chapters on water supply and on the disposal of waste products, being subjects of primary importance, naturally fill most of the first volume.

Sir William Horrocks contributes the section on water purification and a complete description is given of all measures taken in connection with water purification and distribution, not only in France but in all other theatres of war. In France chlorination was carried out from the beginning and continued to be the most successful method of giving safe drinking water,

Elaborate plants were evolved for testing, de-poisoning, filtering, chlorinating and de-chlorinating water supplies and full descriptions of these are given. The value of geological knowledge is shown in the Palestine and Sinai water supplies.

The history of the Mesopotamian water supplies is a résumé of the management of that campaign, from a negligent laissez faire attitude to the evolution of a high efficiency. Pitkeathly and Morrison's excellent work is recognised.

As regards disposal of waste products it cannot be said that any new principles were evolved. But the adaptations and ingenuity displayed were numerous and are fully detailed. Incineration was universal, and various details for the chemical treatment of liquid refuse are given. In Northern Russia there were many difficulties: the closet was usually at the top of the house and in the winter a stalagmite 10 to 15 feet long of frozen faecal matter was often present, which was broken up in spring and transported to the fields where the fragments thawed out later!

With regard to housing the conclusions of the Crimean War Commission of 1857 giving an allowance of 300 cubic feet a floor space of 60 square feet, and allowing at least 3 feet between beds were fully vindicated. Various modifications had of necessity to be made but experience in epidemics of droplet infection (influenza and cerebro-spinal fever), showed that the provision of a minimum space of 3 feet between beds was the most effective means of combating these diseases. Wherever this was done the incidence fell enormously at once. Plans and figures of hospitals and huts are given. The bow-shaped Nissen hut seemed to be the most serviceable pattern type.

The increase of disease due to propinquity is well shown by a comparison of the health of troops on transports and on land.

Clothing—In no war was the soldier better clothed. There was a tendency to turn the soldier into a pack animal however. The problem of the "great coat" does not appear to be solved yet.

The soldier's food—In France there was no stinting of food, the ration was always sufficient in energy-giving material. In England, however, difficulties were met with in fixing a ration which could be considered suitable and sufficient for the large numbers of men under training. Under the rationing system, civilians were apt to complain that the soldier was overfed. The caloric value was taken as the basis and the whole question was thoroughly gone into by a committee of the Royal Society. For the details of the investigation we must refer the reader to the book. The rations given were found to be just sufficient for grown men and to provide a very narrow margin for weight production in recruits. Four thousand calories were given to the fighting men in France, at home somewhat less. The civilian worker's diet was fixed at 3,250 calories. This is a very interesting chapter, showing how scientific investigation was brought to bear on a very difficult problem, and successful redistribution and adjustment accomplished as supplies and necessities varied. The point is brought out, that, but for modern methods of storage and preservation of foodstuffs the war could not have been carried on. The food deficiency diseases are dealt with and a full list of references given to the work done during the war. The investigation of the vitamin content of various foods had valuable applications, especially in Mesopotamia. Marmite and germinating pulse are claimed to have been of great benefit in the prevention and cure of beri beri and scurvy. Much of this work was done at the instigation of Colonel (now Sir W. H.) Wilcox.

One of the most interesting chapters in the book is the description of the Military Physical Test Station at Edinburgh. Here special cases were examined as to fitness and stamina, sometimes the former was present but not the latter, especially in older men. Fitness is defined as the efficiency of oxygenation of

the heart, brain and muscles during exertion, stamina being the power of facing sustained exertion. The test was applied by measuring the CO₂ output lost while breathing first air and secondly an atmosphere of oxygen. A man's capability could be judged and fit work recommended and malingerers could be detected.

The base hygiene laboratory started in a small way but expanded until examinations of all varieties were done.

Malaria perhaps caused more disability amongst operating armies than any other disease. It would not appear that much new knowledge was obtained in regard to the bionomics of malaria, its prevention and treatment. No new variety of parasite was discovered, nor were the accepted cycles of development questioned. Movements of troops from infected areas carried the disease to countries where for long periods it had been absent but indigenous malaria in such countries, England and France, e.g., never assumed appreciable dimensions and indeed was more an interesting curiosity. Temperature was the governing factor in the production of infectivity. In otherwise suitable conditions a higher temperature would appear to be necessary for the sexual cycle of *P. falciparum* than for that of *P. vivax*. A diagnosis of malaria on clinical grounds is not permissible except in extremely typical cases, and the thick film was found most suitable for large numbers of examinations. Initial outbreaks in temperate climates were found to be due to the anopheles staying indoors and thus obtaining the temperature required for the sexual development. The methods of prevention adopted were stereotyped. No definite opinion is expressed as regards the value of 'quinine prophylaxis'. Personal protection and mosquito destruction seemed to have given the best results. The measures for the latter, however, take much time and labour and though much was accomplished it was not until after great havoc had been done amongst the forces. We would like to have seen the work carried out at Dagshai mentioned in this section.

Prevention of Cerebro-Spinal Fevers—At the outbreak of the war but little knowledge of this disease was possessed. It was known to be a disease of young adults with certain seasonal predilections. When therefore great numbers of young men were congregated under conditions which were of necessity not ideal and overcrowding being unavoidable, it was not surprising that the disease assumed important dimensions. Much time, money, and energy were spent in the investigation of the disease and the work of Gordon and others on the types of meningococci, etc., is well known. As regards prevention it is difficult to estimate the value of the various measures adopted or recommended. It seems to have been undoubtedly proved that actual cases could transmit the disease and that proved carriers could later develop the disease, though these were not perhaps ordinary occurrences. Preventive inoculation was not recommended, extensive swabbing for carriers, segregation and quarantine of cases and carriers, and spraying chambers were all used and an interesting discussion of their value is given but the author of the chapter admits that the most efficient preventive measure was the limitation of droplet infection by efficient housing and ventilation and especially by limiting the spaces between beds to not less than 3 feet. The latter was a recommendation by a commission in 1857 and proves again how recommendations made on experience and observations of phenomena may later be substantiated by more exact scientific advances in knowledge.

Proof of the rôle played by flies in the dissemination of dysentery and typhoid was given by detailed experiments in Egypt and Mesopotamia. Indeed in Eastern theatres it became as important to combat the fly as the enemy. Those who spent the summer of 1915 in Gallipoli will remember how life was made miserable by the plague of flies. Interesting detailed descriptions of the various devices adopted for the prevention of fly breeding, and fly killing are given and

will be studied carefully with benefit by those who have to deal with the problem in India

Investigation of the biology of the louse became imperative, not only for the men's comfort but for the prevention of trench fever and typhus. Interesting details are given of Nuttall's (and others') work on the bionomics of the body louse. Hot air at 65°C is sufficient to kill lice and nits and could be used where steam was not available or for articles injured by steam. A 2 per cent solution of lysol or of cresol, used hot, killed both lice, nits, and trench fever virus. Insecticide powders, etc., were disappointing. Laundries and bathing units were valuable adjuncts. At the outbreak of the war, the etiology of bilharziasis and its mode of infection were still unsolved problems. The brilliant work of Leiper and his co-workers elucidated the life history of the parasite and pointed out the way to definite rules and methods of prophylaxis. The mollusc could be attacked and also the cercaria. It is interesting to note that cercariae were killed by storage for 48 hours, or by a temperature of 50°C or by sodium bisulphate in moderate dosage. Chlorination, however, at a titre of 4 parts per 1,000,000 was necessary to kill them. Efficient drainage, domestic ducks, copper sulphate and lime were recommended to destroy the molluscs. Treatment of the disease with antimony tartrate is stated to have been successful.

A short but informative chapter deals with the methods taken for the prevention and spread of trachoma which past experience had shown to be a fertile source of inefficiency and danger to the civilian population on disbandment.

Prevention of Small-Pox—Vaccination and re-vaccination were course compulsory in the army prior to 1914. In 1916 Army Council Instructions issued allowed the choice of vaccination or re-vaccination to the soldier. These were issued in the face of strong medical opposition and it is doubtful whether this capitulation to a certain section of popular opinion was admissible in a national crisis. True, in France small-pox never assumed alarming proportions, but here the civilian population were more or less protected and both the German and French armies were well protected by vaccination. But in Mesopotamia where the disease is endemic, and where, on the retirement of the Turks vaccination of the civil population ceased, circumstances were different and disaster very nearly overtook the army there. The earlier *laissez faire* methods in Mesopotamia were later replaced by a vigorous and energetic policy. But there were many difficulties: conscientious objectors, difficulties of diagnosis, of isolation and disinfection and of obtaining and preserving a potent lymph. A vaccine institute was successfully started at Amara which was handed over to the civil authorities. It is satisfactory to note that it was an outstanding fact that conscientious objectors were the first to be attacked.

Owing to the transference of troops and foodstuffs from India to practically every theatre of war, the possibility of plague epidemics occurring was always in the minds of the army sanitarians. Only in Mesopotamia, however, did plague assume serious proportions. The means taken in dealing with the outbreaks are detailed, and the success of the efforts are revealed in the comparison between the numbers of civilian and military cases. Apparently no novel measures were made use of. A case of primary abdominal plague was reported. In dealing with France no mention is made of the reduction and indeed total disappearance of rats in the front trenches due to the intensive bombardment by high explosives. This, we understand in many cases stopped outbreaks of Weil's disease which is propagated by rats and which appeared in France in epidemic form.

We have been able only to indicate the more salient features of these volumes. Everyone interested in sanitary matters should procure and read the volumes carefully.

THE PRACTICAL HYGIENE OF NATIVE COMPOUNDS IN TROPICAL AFRICA.—By A. PEARSON, M.B., B.S. (Lond.), and R. MOUTCHET, M.D., with an Introduction By Dr. ANDREW BALFOUR. Baillière, Tindall and Cox. 1923. Quarto, pp. 188. Price, 22s 6d.

This is a most interesting and in many ways a remarkable book, whose scope and utility are much beyond that indicated by its title. Its authors—(we regret to have noted that Dr Pearson died quite lately)—were in charge of large labour camps in Katanga in the tropical Belgian Congo and were responsible for the health conditions of the compounds. Labour was imported in many instances from hundreds of miles away. A big mortality or a high incidence of sickness meant a correspondingly heavy loss to the commercial concerns, and reduction of mortality and sickness to a possible minimum by means bounded by conditions of possibility and finance were of course correspondingly advantageous. Every factor bearing on the problem was carefully considered in detail: the type of recruit, his tribal home habits, the class of work and food to which he had been accustomed, the diseases to which he was likely to be immune or non-immune. Experience showed that a careful primary consideration of these factors in relation especially to the place where he was to work and to the type of work required of him led to important conclusions in selecting the right sort of labour. Different often at first sight to what might have been chosen, had physique alone been taken as the criterion. The diseases especially to be combated were tick fever, chigger fleas, pneumonia, tropical ulcer, dysentery and scurvy; the latter including many conditions such as night blindness, gingivitis, diarrhoeic and dysenteric symptoms indicative of a pre-scorbutic state.

The type of hut and the arrangement and lay out of camps found most suitable are fully described and discussed in detail. Great stress is laid on the proper construction of the hut in the beginning. Properly constructed huts can easily be kept clean from *Ornithodoros* ticks, chiggers and other vermin and are easily disinfected. Faultily constructed huts, no matter how much attention is subsequently paid to them, will harbour ticks, tick fever will eventually appear, causing much sickness and subsequent morbidity, especially in non-immune tribes. Small huts and rooms accommodating only four men are especially recommended as limiting disease generally, as also are small compounds of a thousand men as a maximum. Lobar pneumonia appears as an infectious disease almost as scarlet fever does at home and causes a high mortality especially in the more primitive tribes and amongst those who have suffered previously from tick fever. Lister polyvalent vaccines have been found useful, the appropriate strains being isolated by injecting the rusty sputum into mice and sending the desiccated spleen for recognition of the type. Lately in some of the epidemics *Spirocheta bronchialis* has apparently been the causal organism.

Feeding and dieting are carefully considered with regard to diet referring to the composition of the foodstuffs and with regard to feeding to the manner in which the food is issued and the arrangements made for the consumption of food. The prevention of a pre-scorbutic condition, its recognition and cure in recruits before being allowed to work are all important in maintaining health and preventing subsequent disease and breakdown in the worker. The subject of diet and feeding is fully considered in all its details especially in caloric and vitamin value.

General sanitary matters are dealt with adequately. The "fuming pit latrine" a type of deep latrine through which a stream of smoke is constantly passed, would seem to be applicable to India.

The organisations necessary for hospital and for the care of the sick are well described. The open type of hospital ward is recommended not only for pneumonia

but for general use. Wise general counsel in dealing with the African native is given.

The book concludes with two interesting chapters on epidemic diseases and pathology which contain many interesting observations and experiences. Although the subject matter of the book appertains particularly to the Belgian Congo it will be found useful to every worker in tropical hygiene and we heartily recommend it to all interested in tropical medicine and hygiene. The book is very well got up and well printed—the illustrations are clear and well executed. An index would be a useful addition.

Malaria and sleeping sickness do not seem to bulk largely as problems in this particular part of the country.

PRACTICAL BACTERIOLOGY, BLOOD WORK AND ANIMAL PARASITOLOGY—BY E R STITT, A.B., Ph.D., Sc.D., LL.D., 7th 1923 Edition, 766 plus xvi pp. 1 plate and 202 illustrations, Price, 21s net Messrs H K Lewis and Co., London

THE medical man in the tropics whether surgeon, physician, specialist or merely "G.P." ought, in reality, to purchase a microscope almost before he does a stethoscope since the former is much more useful in medical practice in the tropics than the latter. His second or third purchase should be this almost unique book, once a thin and slender volume, now, in its 7th edition, one of not inconsiderable bulk. There is hardly perhaps a book on the market anywhere which gives such wonderful value for its cost.

Stitt is an old and trusted friend and companion of every laboratory worker in the tropics,—or at least we hope so,—for he will find in the answer to almost every enquiry and difficulty. The 1923 edition differs from its predecessor by firstly the elimination of all material which has become obsolete or of questionable practical value and secondly by the addition of an extra 132 pages which the advances made in internal medicine in two years have necessitated.

Of new matter in this edition a chapter on the subject of the study of nutrition stands pre-eminent. Many new illustrations replace those of the former edition, and many new tables have been added, of special value being those dealing with the classification of mosquitoes and those giving the vitamin content and the constitution of different foodstuffs. The table on communicable diseases has become so large that it has been transferred from the front lining to the appendix of the book. The Sachs-Georgi-Meinicke's third modification and the Kahn methods for the Wassermann reaction are fully described in detail, indeed this section of the book is one of special value, Noguchi having contributed a section dealing with his own modification of the test. The section dealing with the bacteriology of water has been re-written by Dr McCoy of the U.S.A. Public Health Service who also contributes one on the toxin-anti-toxin unit and the Schick test. Dr E. Francis has prepared the paragraphs on that new and most interesting disease to which he first drew attention,—tularemia. The section on blood groups has also been revised and considerably enlarged.

It would be easy in such a compendium, to attempt to pick holes—for instance the section on the intestinal protozoa is a little weak, and figs 80 and 82 could be much improved upon, e.g. by figures from Dobell's works. Also we are sorry that the spirochete of Indian relapsing fever has now assumed the name *Borrelia carteri* although we suppose we shall get used to it in time! On the other hand wherever one attempts to criticise one comes across evidences of the original and unique value of the book, e.g. the table of differential characters of the human entamoebæ on pp 376 and 377, which is excellent.

Stitt needs no recommendation both this and the companion volume on tropical diseases are already

universally well known as essential to all students of tropical medicine.

THE WRITING OF MEDICAL PAPERS—By Maud H. MELLISH, Editor of the Mayo Clinic Publications W B Saunders Co., Philadelphia and London 1922 pp 157 Price, 7s 6d net

'A good wine needs no bush, and anything from the Mayo Clinic is deserving of respect. To this splendid little volume, however, we would extend a special welcome. We wish that all our esteemed contributors would buy, read, mark, learn and inwardly digest it. The chapters deal with good usage, vocabulary, the use of styles, abbreviations, the use of tables, etc., punctuation, grammatical notes, "dents," the length of papers, arrangement, outline, construction, case histories, abstracts, chapters, paragraphs and sentences, insertion of references, revision, the selection of a title, the volume of output, the manuscript, and proof correction. At the end is a carefully collected bibliography, which does not omit Sir Clifford Allbutt's well known monograph on the same subject, and an exceedingly useful list of standard abbreviations for medical journals. The whole is well indexed.

The book is replete with apposite and delightful remarks and quotations—"keep down your 'thurs,'" for they multiply like lower organisms," "don't overwork 'hence,'" "don't begin as many as ninety-five per cent of your sentences with 'thus,'" are but three of hundreds of excellent instructions.

Every page of this little book is well worthy of study. We could wish, however, that the author had had to face Indian conditions. It may—or may not—surprise our readers to learn that at least 70 per cent of manuscripts received for this journal have to be almost entirely re-written from beginning to end.

"American" is one language—of which the author is refreshingly ignorant—"English" is another, and "Indo-English" is a third. Ex-directors of Pasteur Institutes in India will be familiar with the statement,—"My aged grandfather has been beaten by a rabid dog" but the manuscripts of even some of our most distinguished contributors are nearly illegible after they have been corrected and an attempt made to express the author's real meaning.

We trust that this book will have a wide sale among our contributors. It may mean hours of leisure, in place of hours of toil, to our editorial staff. If we may venture to suggest one slight addition we would beg the author to add a set of examples of how to avoid splitting an infinitive. We have corrected twelve to day, but have probably overlooked others. We trust that this most valuable little book will have the widest publicity for the need for such a work is undoubted.

INTERNATIONAL CLINICS—A QUARTERLY OF ILLUSTRATED CLINICAL LECTURES AND ORIGINAL ARTICLES—Edited by H W Cattell, A.M., M.D., Vol IV, 32nd series 1922 J B Lippincott Co., Philadelphia and London 312 pp Profusely Illustrated. Obtainable from Butterworth & Co., Calcutta Rs 36-12 per set of 4 volumes

THE aim of the publishers of the "International Clinics" is to make this quarterly publication the leading medical publication in the English-speaking world, and the present volume well lives up to that ideal. It is replete with original articles, profusely illustrated, and written by the leading authorities in Europe and America. From a profusion of subjects it is difficult for the reviewer to select, for every article in the series will appeal both to the general practitioner and many also to the specialist.

In medical welfare work there are articles on mental trauma by Dr S I Franz of Washington, by Dr M E Smukler of Philadelphia on guarding the eyesight of school children—an article which is profusely

Colonel Bradfield's report catch the eye of any public spirited philanthropist in Madras he will take up the matter. There could be no nobler matter for endowment than the saving of life by anti-tetanic serum, and the institution of a "tetanus fund" might help immensely in hospital work in India generally.

The surgery of chronic dyspepsia is a subject which, as our readers know, Colonel Bradfield has made especially his own, and more than 80 cases of chronic gastric or duodenal ulcer were operated on in ten months. The frequency of concealed duodenal ulcer in Indian patients is quite remarkable, and the symptoms are often quite atypical. Visible active peristalsis is often a useful clue in diagnosis. Here the X-ray department under the highly skilled direction of Captain T W Barnard is doing splendid work. The X-ray department moved into its new quarters in March 1922, and the growth of its activities is shown by an increase in the total number of examinations from 2,531 in 1919 to 7,315 in 1921, and 11,757 in 1922. 784 bismuth meals were given during the year. 68 radiographs were taken of the head in connection with Major Wright's work on pituitary tumours and optic atrophy, and 174 dental radiographs. A horse was radiographed,—probably the first horse to be radiographed in India—for an old standing injury to the shoulder. The X-ray room had to be cleared, straw put down, and the animal thrown and anaesthetised to prevent movement. A new X-ray set for the treatment of visceral cancer is being installed, and ionic medication of sinuses continues to give continued success. In fact this is now probably by far the best line of treatment for chronic sinuses and for sinusitis.

In X-ray examination for gastric or duodenal ulcer the points to which attention should be directed, according to Colonel Bradfield, are (a) delay in the passage of the opaque meal (b) bismuth deposited on an actual ulcer cavity, and (c) notch due to spasm of the gastric wall which may occur with ulcer or with other inflammatory conditions of the right side of the abdomen. In general it may be said that the results of surgery in such conditions on Indian patients are good, if the operation be not too long delayed. Early operation is imperative for these patients run downhill very rapidly, yet the condition is often attended with long spells of freedom from symptoms and physicians are chary of sending such cases for operation. The chronic abdomen is an even more difficult subject in India than in Europe, since the stamina of Indian patients is usually lower than that of Europeans, the diets are entirely different, and causes absent from Europe, such as chronic amoebic dysentery and sprue, play an important part in its causation in India. The chronic appendix is an important subject in a population of whom some 60 to 70 per cent are infected with *O. viverris* and the mobile colon is a subject which, in Indian surgery, deserves a chapter to itself. The amount of clinical material available for teaching in Colonel Bradfield's department is shown by the fact that 5,585 patients were treated in 1922.

Major A P G Lorimer, I.M.S. resident medical officer, contributes an analysis of the out-patient department problems in India which should be read by every administrative medical officer in the country. In Madras re-construction and re-constitution are the order of the day, and are clearly in very able hands. The first essential in any large hospital is a well-lit and properly equipped operating room on both male and female sides. These have been reconstructed at Madras. In order to deal with the large number of cases no post-operative dressing is done in the operating rooms, and post-operative dressing cubicles are provided. In the Venereal Department on the male side there are provided a lavage room for gonorrhoea, a dressing cubicle for genital and non-genital sores, a room for the inspection of new cases and a small special dispensary. As far as possible patients should be taught how to carry out these duties for themselves under the supervision of medical students. Special injection days for N.A.B. and similar treatments are set aside. On the female side again separate provision should be made for inspection of new cases, lavage, and dressings.

An interesting departure in out-patient work in Madras in 1922 was the issue to headquarter government hospitals of anti-rabic vaccine from the Pasteur Institute at Coonoor. Some 600 cases were treated during the year at the Madras hospital. Here Major Lorimer pleads for a whole time assistant for this special duty, and the difficulties encountered are such as might have been anticipated. Patients are very reluctant indeed to attend for the full 14 days of treatment, a special attendance ledger has had to be commenced to enter attendances, and the patient's cards are differentiated from those for other patients by having them stamped with a rubber stamp bearing the design of a dog's head.

The weakest point of the outpatient department Major Lorimer considers to be the want of an efficient casualty section. The present position is of the nature of a compromise. Medical cases on entering are taken direct to the detention room and placed on beds for examination. Accident cases are taken straight to the preparation room. For instance a compound fracture case is laid on a stretcher of special pattern, with an iron grid work in place of the usual canvas, which can be unlocked and removed without disturbing the patient. The stretcher is next run on rails into position over a cement bath where dirt, etc., is washed off, and the patient is cleaned up generally. From here the stretcher is run, still on rails, on to the operating table itself. After operation the patient can be taken on the same stretcher to bed, where the stretcher is placed on the bed, its frame work unlocked and removed from under the patient without disturbing him. Thus from the moment of entry until he is in bed the severe accident case is handled with the minimum amount of disturbance and the maximum celerity. The full details for this complete scheme, with overhead trolley dressing stands, are all worked out at present it has been introduced to a partial extent, but it is hoped that sanction will be accorded to the full scheme as elaborated.

For night casualties accident non-stop electric bells are installed in the Duty Assistant Surgeon and Casualty Nurse on duty's rooms, are operated from the porter's lodge, and this should lead to the arrival of the assistant surgeon and casualty nurse on duty and the patient simultaneously in the preparation room. The present emergency theatre is condemned as entirely bad, and here Major Lorimer pleads for a complete and suitable scheme. An emergency instrument cabinet contains equipment for tracheotomy, acute abdominal cases, amputations, trephining and for dealing with strangulated hernias and extravasation of urine.

The whole question of personnel and staff for an out-patient department is a very vexed one and Major Lorimer pleads for a whole time staff for such duties. Under present circumstances with different assistants and different nurses detailed daily for out-patient duties the resident medical officer never knows where he is. He begs for at least a permanent nucleus of some 8 or 9 qualified medical assistants, also for the provision of standardised forms, diagrammatic charts, etc. and for measures to prevent the statistical returns from being vitiated by the same patient coming on three different occasions with three different tickets and being entered as three persons.

As will be seen the report is a veritable compendium of medical interest, full of interesting and suggestive writing and observations, and Colonel Symons and his fine staff are to be congratulated on its issue.

REPORT OF THE PATHOLOGICAL LABORATORY OF THE MEDICAL COLLEGE HOSPITALS, CALCUTTA FOR 1922

By CAPT G SHANKS, I.M.S., Professor of Pathology

CAPT SHANKS' report, which has been printed for private circulation, contains several items of interest and gives evidence of the great value of the newly introduced scheme at the Medical College Hospitals' group in Calcutta of having three clinical pathologists, Dr G P Khan for the medical services, Dr D M Chatterjee for the surgical services, and Dr N P Gupta for the

obstetrical and gynaecological services,—working in collaboration with the general pathological department of the hospitals. The total number of examinations was thus 6,396 in 1922 as against 3,289 in 1921.

Only 51 post-mortems could be obtained during the year, as in India relatives are generally averse to permitting post mortem examinations. 11 were deaths from lobar pneumonia and 7 from chronic nephritis. In carrying out the Widal reaction Dreyer's technique is wisely adopted with the inclusion of a *non-motile* strain of *B. typhosus* which experience has shewn will often give a positive result where the motile strains fail to do so. By this method other diseases do not give positive results, nor does co-agglutination occur. There were six cases of streptococcal septicaemia on the medical side, of which two also gave the *B. typhosus* from the blood and one a positive Widal reaction thus shewing the importance of a secondary streptococcus septicaemia in typhoid fever. Two cases admitted as pyrexia of uncertain origin yielded *B. pestis* on blood culture and the importance of routine blood culture in all cases of fever of undiagnosed causation is emphasised. Seven cases of *B. coli* septicaemia are recorded, one as a complication in typhoid, one in a diphtheria convalescent, and the other five apparently as an independent condition. The aldehyde test has replaced spleen puncture in the diagnosis of kala-azar in the department, except for early cases of the disease. Three patients who were proved infections with typhoid fever subsequently developed kala-azar, but this may be merely the result of chance, *post* and not *propter hoc*, or instances of mixed infection.

On the obstetric side there were two cases of *B. coli* septicaemia, one fatal with symptoms of eclampsia. Of 1,186 urines cultured no less than 503 gave pure cultures of *B. coli* and a new and most ingenious instrument for taking intra-uterine swabs was introduced (*I M G* July 1923 p. 314). One patient admitted in the early stages of pregnancy with vomiting and fever proved to be a case of plague.

On the surgical side there were three cases of streptococcal septicaemia all fatal. In one the primary lesion was a punctured wound of the foot with secondary acute orchitis. In the second the fever was of sudden onset with no primary lesion discoverable, in the third the fever came on gradually with inflammation of the knee and thigh. A case of staphylococcal septicaemia from a laceration of the foot as the result of a tram accident recovered.

Captain Shanks is to be congratulated on a policy of publishing results of interest instead of allowing them to perish among "the mouldering files of decay." The lesson of the *very great importance of blood culture in all cases of pyrexia of uncertain origin* is one which laboratory workers in India should take to heart.

REPORT ON THE PRISON ADMINISTRATION OF BURMA, 1922.

By H H G KNAPP, M.D.

LIEUT.-COLONEL I.M.S.

Obtainable from the Superintendent Government Printing Burma Rangoon Rs 3-8-0

THIS report indicates, in many ways, better conditions and a more hopeful prospect of funds available than does the similar report for the Assam prisons, recently reviewed in these columns. Burma contains 7 central, 24 district and 4 subsidiary jails—the last being under the Police Department. The construction of a central jail at Tharrawaddy for 1,008 prisoners has been taken in hand and good progress is being made. Detailed estimates for a central jail for 1,210 prisoners at Pegu are awaited, whilst the Local Government has decided that a district jail built on the lines suggested by the Indian Jails' Commission and capable of accommodating 200 prisoners shall be constructed at Pyapon. Steps have been taken to acquire land for a new leper jail to be built near the two leper asylums at Mandalay, so that segregation will be effected. It will be seen that, in Burma

at least steps are being taken to improve conditions and to deal adequately with the "housing" problem.

Statement I shews that there were 15,206 convicts at the beginning of the year, and the number imprisoned was 18,625. There was a marked decrease in the number of admissions,—1,383 less than in 1921,—and despite the fact that transportation to Port Blair has practically ceased the daily average 15,078, was only 69 more than in 1921. The number of convicts remaining at the end of the year was 15,365. Statement II shews what scrupulous care is taken to afford religious facilities to the convict population. At Mandalay a small pagoda has been erected inside the jail and Buddhist prisoners are here allowed to perform their devotions. Any Mahomedan or Hindu prisoner requiring the ministrations of a moulvie or priest has merely to ask in order to have the machinery set in motion. Sikhs are allowed oil and soap once a week for their hair.

Colonel Knapp comments, as to-day do other Inspector-Generals of Prisons in India, on the evils of sending juvenile offenders to general jails. "Young delinquents under 16 should on no account be sent to prison if it can be avoided. The effect of doing so is simply to familiarise them with prison conditions and with methods of crime. Not so much harm is done by sending them to a juvenile jail, or a reformatory, but this is useless unless the term is for two or three years and the regimen is truly reformatory. At my inspections I have noticed many cases of young prisoners sent for a few days weeks or months. This is absolutely to be condemned."

It is the young offender who recruits the ranks of the recidivist. Re-convicted prisoners numbered 5,823,—a ratio of 31.26 per cent,—and of 20 youthful offenders 8 had been previously convicted, and 15 were transferred to the Reformatory School at Insein. Of the total direct admissions to the jails 5,428 or 29 per cent. were found to be habituals. Whereas the numbers of non-habituals vary from year to year, Colonel Knapp notes that "there is a steady nucleus or core of recidivism which has on the whole an upward tendency. The same phenomenon is seen in England. It is this nucleus of recidivism that is the real problem before us,—how to deal with it and how to prevent its being recruited from other classes."

There was a marked falling off in the number of minor punishments administered here warnings and admonishing may often do more to reform a prisoner than repeated minor punishments which may embitter him. Major punishments, on the other hand, shewed an increase. It is to be noted that penal diet is usually given on a Sunday, a non-working day, so that the question of whether a prisoner on penal diet should or should not work, does not arise. The tobacco problem is the cause of most of the breaches of discipline in jails in Burma, as elsewhere and at Moulmein the experiment was tried of allowing a ration of tobacco to selected well-behaved prisoners. "Used with discretion and under personal supervision, it is an exceedingly valuable means of maintaining good discipline and obtaining a good out-turn of work."

An account is given of a small riot in Insein Central Jail in April, where five habitual prisoners suddenly attacked a convict overseer, who had reported them for short work, but nine other prisoners came to his rescue. Six men were laid out of whom one convict received fatal injuries. "It is possible to regard assaults by prisoners as indicating special depravity but it must be recognised that jail life, with its narrow interests, breeds a too ready response to slight stimuli and to fancied wrongs. Men employed outside the jail, or inside, on interesting work that calls for intelligence, are less liable to these outbreaks than others." As usual most of the major punishments were inflicted on habitual prisoners and the ever pressing question of the separation of habituals from non-habituals continued to receive attention during the year. 16 out of the 24 district jails are now reserved for the confinement of casuals,—habituals being retained in them only until there is accommodation for them at the other jails, and even then being segregated from the non-habituals.

The conduct and maintenance of discipline in Indian jails depends very largely upon the system of using convict-overseers, and the Inspector-General comments upon the advantages and otherwise of this system. The ideal, of course, would be to have none but this is financially impracticable. As a whole the work of convict overseers is very favourably reported on, one jail superintendent even going so far as to write that "a good convict warder is generally a better man than the average paid warder, being more intelligent and useful in the maintenance of discipline." On the other hand the Inspector-General considers that far too much dependence is placed upon convict night-watchmen in the habitual jails, and the question deserves attention.

Financially the year cost more than did 1921. The cost of upkeep of the Prison Department was Rs 18,86,401,—an increase of Rs 1,87,870 above 1921. Higher rates had to be paid for foodstuffs, and diets cost more. More was spent on sick diets and extras for prisoners in hospital. The average cost of maintenance per head was Rs 116-4-0 an increase of Rs 10-11-0 on the 1921 figures. The chief increase in expenditure was Rs 61,137 on establishment. But the price of paddy is a high item, and experiments are in progress at Bassein for growing paddy on jail land and with prison labour. With regard to employment, the cost of raw materials, etc., was Rs 1,25,342 and the return to government Rs 4,19,898 nearly three lakhs of income for government resulted,—the best result in 15 years.

With regard to diets the beef or fish ration was issued in 1922 twice, instead of only once, a month and additional rations of *dal* and rice allowed to prisoners on specially laborious tasks and to those who lost weight. Diseases due to errors of diet, such as scurvy and beriberi, are noted as being conspicuously absent. An interesting note records that at the close of 1921 there were 68 prisoners under training in microscopical technique, of whom 23 were efficient. During 1922 a further 39 were placed on such training, of whom 12 became efficient. Unfortunately it has been found that such trained men, upon release, find difficulty in securing employment, but the value of such trained assistants in examining a jail population for hookworm should be very great.

Almost all of the Jails' Commission's recommendations with regard to clothing have been brought into force,—financial considerations alone preventing the issue of an extra set of clothing and bath towels. Every healthy prisoner was vaccinated or re-vaccinated upon admission and there were no cases of small-pox. 55 per cent of prisoners gained weight, 16 per cent lost weight, and 29 per cent remained stationary. The daily average sick rate was 236 per mille, and the death rate only 1571 per mille. Of the 255 prisoners who died, 113 are noted as having been admitted to jail in indifferent health. The admissions for dysentery rose, especially in Rangoon jail, but chiefly owing to earlier diagnosis and segregation, and there was a reduction in the death rate of 0.47 per mille from this disease. Tuberculosis is an important problem in Indian jails, there were 210 admissions during the year, 195 of them for phthisis, with 71 deaths of which 63 were from phthisis. The disease is usually acquired before admission to jail, and is most carefully looked for and diagnosed early. The special tuberculosis ward at Myingyan jail is the only one of its kind in Burma, which has as yet no special tuberculosis hospitals for the free population, but is inadequate to existing needs. Enteric fevers were a cause of much trouble, and accounted for 76 admissions with 14 deaths. Lieut-Colonel J. C. G. Kunhardt, I.M.S., from the Pasteur Institute at Rangoon made a study of conditions at Insein jail, and concluded that typhoid is perhaps commoner in Burma than in India. The water supply was above suspicion, flies may be a contributory element, but carriers are the main source of infection. T. A. B. vaccine is now used to inoculate all prisoners admitted to the jail at Moulmein. There were 27 admissions (only) for beriberi during the year with one death. 25 of them in connection with a small outbreak in the leper jail at Pagan. The rice supply has been sent to

the School of Tropical Medicine at Calcutta for inoculation. Ankylostomiasis accounted for 798 admissions with 2 deaths. The percentage of infections is higher than in previous years, but this is accounted for by more strenuous steps taken for early diagnosis, including the training of convict microscopists. At Henzada jail there were three cases of plague,—all fatal,—and 2,392 persons were inoculated with anti-plague vaccine. Plague manifested itself in several of the districts in which jails are situated, but they escaped the infection.

The chief interest of Colonel Knapp's report, however, both to the general reader and to the reader with experience of jail administration, will be found in Chapter 4 where he presents a most careful, interesting and well written essay on the question of the prison system in general. Burma is rather notorious for crime, and the whole relationship of crime to its existing prison system deserves examination. There are, perhaps, six objects involved in sending a man who has committed a crime to prison. The first is to keep him from committing further crimes whilst in prison, and this may be said to be effectively carried out. The second and third are to prevent him from committing further crimes after release, and to prevent others from committing similar crimes. That the Indian jail system is deterrent in a general way cannot be gainsaid. Contrary to a popular superstition, the Burman hates jail life, he loathes its monotony, its discipline, and its arduous tasks. On the other hand we have in the recidivist an example of *adaptation* to his environment,—not infrequently a "good" prisoner, as far as discipline goes, but one who leaves the jail a thoroughly bad citizen. These men have developed the "herd instinct" many of them—homeless, friendless and landless,—find freedom too hard a thing, and make no fight against a return to crime and prison life. "It is this class that swells our criminal returns and that causes others to fall into crime, and it is this class which would be best dealt with by the system of preventive detention, with decent surroundings and a certain measure of freedom, to be attained by their own efforts. But that is an ideal solution of the most difficult problem in penology." In Burma, at least, a prime cause of crime is lack of parental or other control at the critical age. To some the idea appeals that such a class of criminal is best dealt with by severe punishment. But torture is out of date, the chances of committing crime with impunity are not unfavourable, and such a solution—as all historical experience shews—leads nowhere.

In reality the fourth factor, the gratifying of the instinct of society for retribution, still underlies our whole system of punishment. Yet it cannot be admitted to govern our disciplinary methods. A fifth factor is the hope of reformation of the prisoner. Yet on the whole prisons are not, and as yet cannot be made, reformatories. A few prisoners reform, but they are the minority, and they reform rather in spite of, than because of, the prison system. The sixth factor, writes Colonel Knapp, is to enable the offender to repair the injury which he has inflicted. Practically this is impossible under modern conditions. "One may conclude by saying that the whole world has been, and is, making experiments. There is no perfect jail system. All is uncertain. The royal road has yet to be found. One is glad to note of recent years in Burma an increasing interest in these matters and the formation of a public opinion. The Prisoners' Aid Society and the local jail committees will greatly help. You may solve an immediate problem when you imprison a man for a crime, but it is often at the cost of creating a still more difficult problem—what to do with him when he is released."

It may be safely asserted that humanitarian methods of dealing with criminals are more efficacious from the preventive point of view than those that incline to severity. The direction of prison reform should have as its aim the closing of jails rather than the building of more of these costly institutions. A sane and careful exposition of the whole subject, but one which recognises the difficulties with which it is hedged

[illegible]

It is general purpose use use of standardizing or common counts as the essential basis for the comparison of various conservative techniques was established by the United Nations recent work as well as our own based on the belief that by such counts a true indication of the drum content of any specimen of

faeces can be obtained. Further research, to be presently published and which has been made possible by a grant from the Royal Society, research which uses as a check direct centrifugal floatation specially modified for the purpose, shows that this is unfortunately not the case, a finding which alters the definitive but fortunately not the relative values of all work completed on this matter.

The second example, also to be shortly published, is that ankylostome ova, kept under conditions presumably approximating to those of the septic tank, may remain unchanged and susceptible of concentration by direct centrifugal floatation for weeks, a fact which has disquieting hygienic possibilities.

It does not to my mind admit of question that our knowledge on many matters essential for proper control of the hookworm problem is inadequate for its purpose, and that until this is rectified by further research there must continue to occur deplorable loss of public money. To wait until research is complete and perfection attained is to be more than a fool, but fortunately every advance gained by research will mean, must mean, that each inadequate rupee spent on detection, cure and prevention, benefits more persons. I put forward the need for research not as an ideal, although it is an inspiring one, but as a gross, vulgar, money-making, money-saving proposition, but many lesser voices have cried in the wilderness since John—Yours, etc.

CLAYTON LANE,
Lt-Colonel, I M S (Rtd)

EALING W 5
19th September, 1923

(Note—We are glad that Colonel Clayton Lane has taken the opportunity to correct any unintended misrepresentations of his views which may have found their way into the editorial of which he complains.)

Colonel Lane's letter might convey the impression that the editorial complained of was hostile. This is far from being the case, as will be seen by any one who takes the trouble to read the editorial which contains such expressions as "We heartily agree," "the valuable critical contribution etc."

Colonel Lane begins by defending certain points which were not attacked. The references in the editorial to light infections, "two courses of chenopodium trusted, etc." were merely brief summaries of Colonel Lane's views, they contained no expression of dissent.

When Colonel Lane quotes Augustine, apparently with approval, and proceeds to formulate a new term based on these views, it was pardonable for us to assume that he accepted the views in question. For all we know they may be correct, but they will have to be checked before we can agree that they state a rule of general applicability.

It is perhaps our criticism of the new term "privity infection" that is most strongly resented by Colonel Lane, he seems to think that the feeble jest about the word privity is in bad taste. We much regret that what was regarded as an innocent "aside" should have been taken so seriously and we promise to keep to the narrow path of scientific journalese in future. For the rest our differences from Colonel Lane consist in our being rather more optimistic than he is, and after all, so long as optimism does not keep people in a fool's paradise, it is a fault on the right side.

The chief value of the offending editorial has been that it has called fourth a valuable contribution to the subject of hookworm disease from so great an authority as Colonel Clayton Lane. If for no other reason than this we may hope to be forgiven for having "rushed in where angels fear to tread"—EDITOR, I M G)

THE DIETETIC VALUE OF SAGO

To The Editor, "THE INDIAN MEDICAL GAZETTE."

SIR—Would you or any of your readers kindly let me know (a) the properties of sago, (b) its nutritious

value, (c) whether sago can be replaced by rice or rice, and (d) if not, why not, as rice is lighter and more nutritious than sago, also it is universally used by the Indian patient—Yours, etc.

S MUKHERJI

PUTHARJHORA TEA ESTATE,
SAILHAT, JALPAIGURI
17th August, 1923

Note—Sago is a farinaceous food obtained from the cellular starchy pith of several species of a genus of palms, especially *Sagus laevis* and *Sagus rumphii*, the latter yielding the finest kind of sago. Both these species are natives of the Malay archipelago. The Malay word *sagu* means "bread" from the circumstance that sago forms the chief farinaceous diet of the Malays. To procure sago, the trees, which grow to a height of about thirty feet, with a diameter of about one and a half feet, are felled with their flowering spike forms. From the stems, which are cut into convenient sections, the pith is extracted, and beaten in receptacles of cold water to separate the starch granules from the woody filaments with which they are associated. After washing and straining, the meal is dried. For exportation the moist sago is dried and rubbed to smaller granular pellets, and according to the size of these is designated as 'pearl,' 'medium' or 'bullet' sago. An imitation is made from potato starch, but is easily detected by the microscope. A common variety of sago is made in India and Ceylon from various species of palm tree. Sago from its ready solubility is easy of digestion, and is a valuable light nutritious farinaceous food. It is largely used in the preparation of soluble cocoas.

The average comparative analytical values of rice and sago are shown below—

	Carbo- hydrate	Nitro- genous Matter Proteid	Fat	Mineral ash	Water
Rice	78.5	6.5	1.5	1.0	15
Sago	86.0	0.8	0	0.1	13.1

It will be seen that sago is composed largely of carbohydrate and that it contains practically no fat or salts, and very little proteid. Its food value is less than that of rice and it therefore could not take the place of rice (which is itself relatively deficient in fat, proteid and salts), as a staple diet. This also explains why in India and most other countries the use of sago is confined to the invalid dietary or as an occasional food—A D Stewart

INTRAVENOUS SODIUM SALICYLATE

To The Editor, "THE INDIAN MEDICAL GAZETTE"

SIR—I am interested in your correspondent's experiences about the injection of sodium salicylate subcutaneously and intramuscularly in acute rheumatism. It appears, however, not to be generally known that sodium salicylate can be given intravenously as well as and with still better and quicker results. Our treatment in the Bikaner District Hospital for all such acute, sub-acute and chronic cases is mainly sodium salicylate intravenously (15 grs in 10 c.c. of distilled water). The acute cases get daily injections and sub-acute and chronic cases injections on alternate days. In the latter class of cases nowadays I have added sodium iodide 15 grs to 10 c.c. The iodide helps in old standing cases and is better tolerated than when given by the mouth. Iodism by this method is rare. The injections can be continued for over a month without any ill effects. The salts generally used are physiologically pure, but in the absence of these any reliable pure salts serve the purpose quite well. We keep sodium salicylate 15 grs to 10 c.c., sodium iodide 15 grs to 10 c.c., and also a combination of sodium salicylate and sodium iodide 15 grs each to 10 c.c. of distilled water in ampoules sterilised under pressure. I shall be glad to

supply any of these if required for private or hospital use.—Yours, etc

D M VASAVADA,
Asst Surgeon

BIKANER
7th September, 1923

A CASE FOR DIAGNOSIS

To The Editor, 'THE INDIAN MEDICAL GAZETTE.'

SIR,—I would be much obliged if any of your readers could enlighten me with regard to the following case —

The patient is a male adult, aged 34 years, who has suffered from pain in the spine and sides of the chest for the last three years. He has been treated by many different doctors without benefit. For the last ten months a swelling has been noticed on the left side of the vertebral column, extending from the 8th to the 11th dorsal vertebra. A skiagram was taken and a tumour was seen in this region, measuring about 4½ by 4 inches. There is also apparent disease of the ribs. The case has been diagnosed by different medical men as one of aneurysm of the descending aorta, with erosion of the left sides of the bodies of the 8th, 9th, 10th and 11th thoracic vertebrae. If that be the case then it is evident that the vertebral ends of four ribs are also eroded. The tumour presents on the back as a mass about the size of a large apple, it is homogeneous, soft, fluctuating and pulsating. There is nothing abnormal to be detected on auscultation and examination of the heart. Both radial and tibial pulses are normal.

The patient gives a history of syphilis some years ago. There is no bruit over the tumour and there are no signs of referred pain over the associated intercostal nerves. The patient has been getting one drachm of potassium iodide three times daily for some months without apparent improvement.—Yours, etc.

HARI CHARAN GUPTA

MUKTAGACHA,
MYMENSINGH
24th August, 1923

(Note.—Possibly a case of either gummatous or of tubercular disease of the vertebral column?—EDITOR, I M G)

THE DIFFERENTIAL LEUCOCYTE COUNT

To The Editor, 'THE INDIAN MEDICAL GAZETTE'

SIR,—It would appear that there is even now (1923) no fixed standard of classification for leucocytes. And the chief difficulty lies in what is and what is not a large mononuclear leucocyte. Having looked through several works and pictures and finding that there is no standard, I think that the only common sense method to adopt in a differential count is to classify two main groups only —

- (1) Polynuclear leucocytes
- (2) Mononuclear leucocytes

The only other cell that deserves mention at all is the eosinophile variety of the polymorphonuclear cell and where this is within normal limits it need not be mentioned, but should be classed under polymorphonuclears.

We are all agreed that small and large lymphocytes should be classed together, but few are agreed as to when a lymphocyte becomes a large mononuclear or a transitional some depending on the shape and position of the nucleus, others on the size of the cell, and others again on the staining—whether well stained or faintly stained and hence "hyaline."

As there is no universal standard the entire lymphocytes large mononuclears, etc., should be classified as mononuclears and we should speak of a mononucleosis instead of (say) a lymphocytosis. A normal differential count would then read —

Polynuclears
Mononuclears

70 per cent
30 per cent

and this again would depend on the stain used with Leishman's stain the blood picture would give a larger percentage in favour of mononuclears than if, say, Ehrlich's tri-acid stain were used. Therefore the words "Differential Leucocyte Count" should be followed by the name of the stain used, thus "Differential Leucocyte Count (Leishman)"

As some people, however, will diagnose malaria on a 'large mononuclear' count, perhaps, Sir, you will tell us what a large mononuclear leucocyte is? Could you classify it under these three headings —

- (1) Size i.e., in comparison with a normal red blood corpuscle
- (2) Nucleus (i) shape circular, kidney shaped, with a "dent," etc (ii) Position centrally placed or eccentric
- (3) Staining properties using one stain (or any given stain) as a standard.—Yours etc.

L W HEFFERMAN

NAMTU
20th August, 1923

(Note.—We do not think that the consensus of opinion will agree with Dr Hefferman's suggestion, as the full differential leucocyte count is of considerable value in tropical medicine. We would define the large mononuclear leucocyte as a cell considerably larger than an erythrocyte, about 12 to 16 μ in diameter, with the nucleus always with a dent, eccentric in position. With any of the Romanowsky stains the nucleus stains a faded royal purple the cytoplasm a very pale blue, sometimes containing azure granules. The transitional form which is always classified with the large mononuclears has a kidney shaped and more deeply staining nucleus. The large lymphocyte is smaller, has a deeply staining spherical nucleus, and the cytoplasm stains a bright glassy blue. The nucleus is central, and there may be azure granules in the cytoplasm. In the differential leucocyte count eosinophilia occurs especially in ankylostomiasis, trichinosis and asthma, polymorphonuclear leucocytosis especially in sepsis and pneumonia, lymphocytosis especially in lymphatic leukaemia, the enteric fevers and whooping cough whilst young children in health usually shew a high count increased mononuclear leucocytosis in kala-azar, malaria and sometimes in anæmia.—EDITOR, I M G)

HOOKWORM DISSEMINATION

To the Editor, 'THE INDIAN MEDICAL GAZETTE'

SIR,—With reference to Dr G C Ramsay's article on "The Dissemination of Human Helminthic Infections by Animals" in your September number, I should like to ask how Dr Ramsay proved the larvæ hatched from pigs' faeces to be larvæ of human hookworm.

The American workers referred to by Colonel Balfour omitted also to mention this point in their original papers.

I have hatched out thousands of larvæ from the faeces of pigs who had swallowed human hookworm ova, and thousands from control animals who had not. An enormous proportion of these were demonstrably not larvæ of the human type and those that were morphologically indistinguishable from the larvæ of human hookworms were feeble and did not survive for more than a few hours.

I have already pointed out the destructive effect of temperatures above 98.4° F on the ova of ankylostomes and necators, and as the normal temperature of the pig is I believe about 104° F, survival of living human ova is unlikely. The problem requires further investigation as many planters of experience have quite opposite views to Dr Ramsay on the subject of the detrimental effects of pig-keeping.—Yours, etc.

CALCUTTA,
2nd October, 1923

J BORLAND McVAIL

Service Notes.

OBITUARY.

THE LATE MAJOR-GENERAL, SIR
WILLIAM RICE EDWARDS,

KCB, KCIE, CMG, BC, IMS (Retd)



[Photo by Johnston and Hoffmann]

THE news of the sudden death of Sir William Edwards from pneumonia on October 13th came as a painful surprise to his numerous friends in India. Sir William was suddenly struck down by his fatal illness when he was on the point of leaving London for Paris where he was going to represent India at a meeting of the Committee of the International Bureau of Public Health.

It is only a few months since Sir William's departure from India was the occasion of several farewell gatherings at which the members of his service and many other friends expressed their great regret at his departure from India.

On more than one occasion Sir William has been known to comment on the extraordinary mortality that has prevailed among the men in the highest ranks of the Indian Medical Service, and his words now come back to us as an omen. It is quite likely that he realised that he had exhausted most of his reserves in bearing "the white man's

burden," but he never complained, nor was his accustomed cheerfulness of outlook diminished by the premonition of early death. All through his service he displayed a calm courage which enabled him to ignore the handicap of a constitution which was never robust. Perhaps he would have chosen to die as he did in full possession of his mental activity rather than to rust out in retirement, but we feel that his death is a further serious blow to a service which has endured many buffets from fate in the past few years.

Sir William was born in 1862, and was the son of the late Rev Canon Edwards of Monmouthshire, he was educated at Magdalen College School and Clifton College. His medical training was passed at the London Hospital. He entered the Indian Medical Service in 1886, and spent two years in military employment. He then served as Civil Surgeon of Nadia in Bengal till 1890 when he was appointed to the staff of Lord Roberts. In 1900 he became Surgeon to the Headquarters Staff of Lord Roberts in South Africa, his services being recognised by the award of the C M G.

Most of his service was passed in the Political Department in Kashmir and elsewhere. He became Administrative Medical Officer to the North Western Frontier Province in 1910, Surgeon General to the Government of Bengal in 1915 and Director General of the Indian Medical Service in 1918.

The list of honours and distinctions which he received might suggest to the uninformed that he sought official favour rather than the interests of his subordinates, but such was far from being the case. It is an open secret that he never hesitated to oppose those in high places when he regarded them as hostile to his Service or to the medical profession in general. The interests of the most humble members of medical services and departments and of the masses of India were of greater importance to him than the smiles and favours of the great men of the Government of India. Those who were privileged to be present at the farewell dinners given to him on the eve of his departure from India will always remember with what pride he told the story of his battles for the medical profession, how he fought in the teeth of official opposition and displeasure. He made it clear that his greatest ambition was to justify the confidence of his fellow medical men. It is a striking testimonial to his singleness of purpose that he obtained in the fullest measure the love and esteem of everyone in the Indian Medical Service in spite of the fact that the service was passing through a period of crisis and depression unexampled in its history. Among his other fights for the welfare of the medical profession may be mentioned his whole-hearted support of the scheme of Sir Leonard Rogers for the establishment of the Calcutta

Pregnancy, Lactation and Diet

"The diet of pregnant and nursing mothers should be rich in the accessory factors (vitamins) so that they may be able to supply their offspring.

"A mother's milk is only adequate when she receives a sufficiency of these subjects (vitamins) in her own diet."

pp 70 and 100 Report of Joint Committee of Lister Institute and Medical Research Committee on "Accessory Food Factors (Vitamins)" H M Stationery Office, 1919

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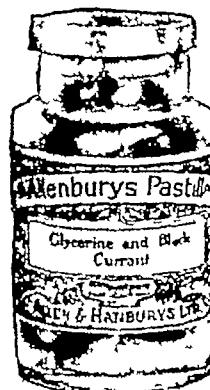
The 'Allenburys' PASTILLES

Glycerine and Black Currant Pastilles

Delicate in flavour

Efficient in use

They are manufactured from pure glycerine and the fresh juice of choice ripe black currants by a special process which conserves the full value and flavour of the fruit. The 'Allenburys' Glycerine and Black Currant Pastilles have a demulcent and mildly astringent effect, most useful in allaying simple irritations of the throat. They dissolve slowly and uniformly, and have a delicious and slightly acidulous flavour.



Supplied in glass bottles containing 2 ozs., 4 ozs., 8 ozs. & 1 lb respectively

Menthol & Eucalyptus

(No 54)

Menthol $\frac{3}{16}$ gr

Eucalyptus Oil $\frac{1}{4}$ min in each

A useful antiseptic pastille particularly applicable in the treatment of pharyngitis, laryngitis and influenza

Antiseptic Liquorice

(No 71)

Menthol

Benzolic Acid

Eucalyptus Oil $\frac{1}{4}$ min

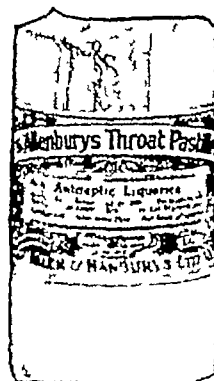
Thymol $\frac{1}{10}$ gr

Ammonium Bromide $\frac{1}{2}$ gr

Ext of Liquorice 5 grs in each

A valuable compound for laryngitis and for other throat affections complicated with bronchitis and cough

Descriptive Booklet and Price List sent on request to members of the Medical Profession



Packed in glass bottles containing 3 ozs., 8 ozs., and 1 lb respectively

Allen & Hanburys Ltd.

LONDON.

Special Representative for India

A H P JENNINGS, Block E, 2nd Floor Chive Buildings CALCUTTA.

School of Tropical Medicine, it is sad to think that he and the other two great members of the Service who did so much for that school have gone to their long rest. Appropriately enough the portraits of Sir Pardey Lukis, General Robinson and Sir William Edwards occupy conspicuous places on the walls of the School.

In private life Sir William had a most charming personality, he was loved by many and held in affectionate esteem by all, even by those whom he opposed most strenuously in his official capacity. He was accessible to a remarkable degree to all, and every one who came in contact with him was forced to recognise that in Sir William he had a real friend who would do all in his power to serve his interests so long as these were compatible with the efficiency of the department. He was a shrewd though kindly judge of men, he had a keen sense of humour devoid of the cynicism which too often accompanies that possession. As a speaker his effectiveness was not due to any display of oratory but to the faculty of saying what ought to be said in such a way as to command attention and respect for his utterances.

There were few men who could speak with such a degree of candour without giving offence, some of his speeches in fact appear to be studied indiscretions, and yet there is no record of his having been taken to task for his remarks.

The deepest sympathy of all of us goes out to Lady Edwards who did so much to lighten the labours of her late husband without in the slightest degree meddling in official matters. Her chief consolation in her great loss will be the knowledge that she has in the fullest degree the friendship and esteem of all of her husband's large circle of friends. Sir William Edwards often said that if the Indian Medical Service were to die he hoped it would go down with colours flying, such a death he encountered himself and we cannot desire a better one for the Service if the fates decree that it is doomed.

Let us hope, however, that the present crisis will pass over and that a reorganised and strengthened Service will play its part in the service of India for generations to come.

If this happy result should follow it will be in no small measure due to the fact that Sir William was at the helm of the Service during its passage through stormy waters. While we deeply regret that he was not spared to continue his great work on behalf of the medical profession and people of India, we are fortunate in that he was able to do so much in spite of all the difficulties against which he had to contend.

APPOINTMENTS AND TRANSFERS

LIEUT-COLONEL J H MURRAY C.I.E., I.M.S., appointed on special duty in Poona, with effect from the 3rd September 1923 up to the 30th idem inclusive and

thereafter to do duty as Superintendent of the Central Prison, Yeravda.

Lieut-Colonel A B Fry, C.I.E., D.S.O., I.M.S., appointed to act as President of the Bengal Council of Medical Registration, *vice* Lieut-Colonel D McCay, M.D., I.M.S., resigned.

The services of Lieut-Colonel H H Halliday, M.D., I.M.S., are placed at the disposal of the Government of the Punjab with effect from the 20th October 1923.

Lieut-Colonel W W Jendwine, C.M.G., M.D., I.M.S., appointed as Civil Surgeon, Simla West, with effect from the date on which he assumes charge.

Lieut-Colonel I A Black, M.B., I.M.S. appointed as Inspector-General of Civil Hospitals, Central Provinces, with effect from the 27th October 1923.

Major H R B Gibson I.M.S. assumed charge of the Civil Medical duties of Bannu district and Tochi Agency and Medical Officer of Tochi Scouts, with effect from the 18th September 1923.

Major A D Stewart I.M.S. appointed to act as Professor of Hygiene, School of Tropical Medicine and Hygiene, Calcutta, *vice* Lieut-Colonel A B Fry, C.I.E., D.S.O., I.M.S.

The services of Captain J P Hublin, O.R.E., M.B., I.M.S. are placed temporarily at the disposal of the Chief Commissioner, Delhi, with effect from the date on which he assumes charge.

LEAVE

LIEUT-COLONEL R M DALZIEL M.D., I.M.S. acting Inspector-General of Prisons Bombay Presidency, granted leave for 10 months with effect from the date of relief.

Lieut-Colonel L Cook, I.M.S. Civil Surgeon of Bhagalpur, granted leave for one year with effect from the date on which he avails himself of it.

Lieut-Colonel G McPherson C.I.E., is granted 6 months' extension of leave.

Major W J Simpson, M.B., I.M.S. Civil Surgeon of Hazara granted leave for 2 months and 13 days, with effect from the 25th July 1923.

Major H R B Gibson, M.D., I.M.S. Agency Surgeon Tochi, granted leave for 3 months and 12 days, with effect from the 6th June 1923.

Major J B Lapsley, M.C., M.B. F.R.C.S., I.M.S., Officer in charge, Medical Store Depot, Madras, granted leave for 36 days and in continuation of furlough in India for 30 days with effect from the 27th August 1923.

PROMOTIONS

Colonel to be Major-General

C H BOWLE-EVANS, C.M.G., C.B.E., M.B., V.H.S., on appointment as Director, Medical Services in India, dated 6th September 1923.

Majors to be Lieutenant-Colonels

G J Grafton Young, M.B. Dated 28th June 1920
Merwan Sorab Irani Dated 30th July 1923

Lieutenants to be Captains

Alfred Innes Cox. Dated 18th January 1922
Herbert McKenzie Strickland Dated 22nd September 1922

Jiwanda Ram Katariya Dated 16th October 1922
Shival Deva Singh Greval, M.D. Dated 12th November 1922

Radha Krishna Tahilram Advani, M.B. Dated 14th November 1922

To be Captains

J H Barrett, G H Fraser, and T H Thomas
Dated 1st August 1923

To be Lieutenants

H Summers (since deceased), G M Irvine and D Kelly Dated 1st August 1923

To be Lieutenants (temporary)

The undermentioned gentlemen to be temporary Lieutenants, subject to His Majesty's approval —
Rama Shankar Varma Dated 22nd September 1923
Kashu Ram Sahgal Dated 26th September 1923

Chandiram Ghurbamal Malkani Dated 28th September 1923

Ambika Prasad Trivedi Dated 30th September 1923

Sarveshwar Nath Kaul Dated 4th October 1923

Hari Narayan Shivapuri Dated 5th October 1923

RETIREMENTS

LIFUT-COLONEL J PENNY (Madras) Dated 23rd September 1923

Major-General Sir C C Manifold, KCB CMC MB, RHP Dated 24th June 1923

Colonel R. G Turner, CMC DSO Dated 17th August 1923

Major N H Hume Dated 18th August 1923

RESIGNATIONS

CAPTAIN PANDIPEDDI KUTUMBIAH Dated 10th August 1923

Captain Pavanji Ramchandra Rao Dated 11th August 1923

Captain Lall Mohan Ghosh Dated 24th August 1923 and to retain his rank

Captains Shanker Vishnu Velankar and Bhasker Ramchandra Chandorker Dated 1st September 1923

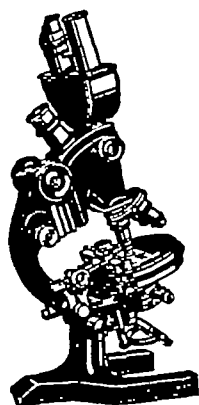
Captain Gulam Ali Miri Dated 1st September 1923

Captains Jagdish Chandra Gupta, Sayyad Habib Ullah Shah and Upendra Nath Banerji Dated 1st September 1923, and to retain their rank

NOTICES.

A NEW BINOCULAR MICROSCOPE, EYEPIECE AND NEW BINOCULAR-MONOCULAR MICROSCOPE

THE problem of obtaining stereoscopic vision with high microscopic powers has been one of great difficulty. For low and moderate powers it is possible to use a double microscope of the kind invented by Greenough, and with this magnifications up to about 180 diameters have been obtained, but only narrow angle lenses of low resolving powers are capable of being used. The firm of Reichert of Vienna has always been most enterprising in connection with developments in microscopical and allied instruments and one of their most recent devices is a detachable binocular eyepiece by which any ordinary



REICHERT

microscope can be converted into a stereoscopic microscope without any special fitting of any kind. It is interesting to note that the stereoscopic eyepiece can be used separately as a magnifying glass of low power for dissection or other work.

The eyepiece can be used with any objective, even with oil immersion lenses and the special construction results

in a remarkable degree of plasticity of the image even with the highest powers.

It is often considered desirable to change over rapidly from monocular to binocular vision and *vice versa*, another instrument of Reichert's enables this to be done without making the slightest change in the adjustment of the microscope. This is the large monobinocular microscope shown in the accompanying illustration. The change from monocular to binocular vision is made simply by a turn of the milled head shown below the binocular eyepiece.

The use of the binocular microscope for high power work is rapidly increasing. Apart from the stereoscopic effect, the relief from eye strain is very great and there is not the slightest doubt that the microscope of the future will be a stereoscopic binocular, easily convertible into a monocular. For those who cannot afford the larger expensive instrument the eyepiece attachment can be strongly recommended. The change from binocular to monocular and *vice versa* is almost as easy as changing an eyepiece. Adjustment for differences in inter-pupillary distance is readily made by a rack and pinion, and for inequalities in the refraction of the two eyes by a screw in one eyepiece.

A complete description of the new binocular microscopes is contained in the *Deutschösterreichischen Zentral-Zeitung für Optik und Mechanik* No 7, 1923, by Ewald Schild of Vienna. Price lists and descriptions can be obtained from Messrs C Reichert, Vienna, Austria.

VIROL, LIMITED

SPEAKING at the annual meeting of Virol, Ltd, the Chairman Mr B S Straus, J.P., said that although the clinical properties of Virol had been established by its use for a long period in more than 3,000 hospitals and welfare centres, the recent investigations of bio-chemists afford important confirmation and explanation of its physiological value. It was now recognized that growth, development, and resistance to infection were dependent upon an adequate supply of vitamins in a diet that was properly balanced, and it was the combination of these essential properties in a digestible form that had established the value of Virol during all stages of growth and in all conditions of malnutrition.

Virolax was a combination of Virol, with certain modifications, and chemically pure paraffin. Refined liquid paraffin had long since secured a well-deserved position as a habitual laxative for those persons who suffer from diminished intestinal vigour or activity. Sir Arbuthnot Lane, in his classic work on intestinal stasis, was emphatic on its value.

In Virolax the paraffin was administered in an ideal form, whilst the nutritive properties of Virol were presented to the intestine in a condition that was easy of assimilation.

Notice.

SCIENTIFIC Articles and Notes of interest to the profession in India are solicited. Contributors of Original Articles will receive 25 reprints of the literary pages of the *Gazette gratis*, if asked for at the time of submitting their manuscripts.

Reprints of the article concerned (only) in place of reprints of the whole of the literary matter of the issue can be supplied on payment.

Communications on Editorial Matters, Articles, Letters and Books for Review should be addressed to THE Editor *The Indian Medical Gazette*, c/o Messrs Thacker, Spink & Co, P O Box 54, Calcutta.

Communications for the Publishers relating to Subscriptions, Advertisements, and Reprints should be addressed to THE PUBLISHERS, Messrs Thacker, Spink & Co, P O Box 54, Calcutta.

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